

HODDER's ARITHMETICK:

OR, THAT
NECESSARY ART

Made most easie.

Being explained in a way familiar to
the *Capacity* of any that desire to
learn in a little Time.

By James Hodder, *Writing Master.*

*The Seventeenth Edition, revised, augmented
and above a Thousand Faults amended, by
Henry Mole, late Servant and Successor
to the Author.*

. L O N D O N,

Printed for *Ric. Chiswel* at the *Rose and Crown* in
St. Paul's Church-yard, and *Tbo. Sawbridge* at
the *Three Flower-de-luces* in *Little Britain.*

MDCXC.



Hee that more of thine Excellence would Know
On this thy Book let him some thoughts bestow;
Deep Questions in Arithmetick here are
Demonstrated by Rules so plaine so Rare,
Envy it Selfe must needs confess thus much
Read all y^e Book's ith World you'll find none such

T.H.

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S

TO HIS
REALLY LOVING

AND
Most Worthily Honoured

FRIEND,

JOSIAS DEWYE,

MERCHANT and CITIZEN

OF

LONDON:

JAMES HODDER

In token of True Gratitude for
Unmerited Kindnesses

HUMBLY DEDICATETH

THIS

Manual of Arithmetick.

A 3

To the Reader.

HAVING for sundry years kept a Writing School in this City, and thereby gained some experience in that commendable Art, I thought good heretofore to publish somewhat thereof.

And now for the better compleating of Youth as to Clerkship and Trades, I am induced to publish this small Treatise of Arithmetick, which though it be dedicated more particularly to my much honoured Friend, yet being assured he can be content that others should partake of the benefit thereof, I make bold thus to communicate it.

I need not go about to speak any thing in praise of Arithmetick but shall willingly submit what is here treated of, to the candid censure of the more judiciously skillful.

And as I shall condemn no Mans diligence in what he hath formerly done, so I think none will blame my endeavours at the present; for though I know it impossible to please every Man, and therefore am not solicitous how to do it; yet according to the ability which God hath given me, I have laboured to make a more clear discovery of some Intricacies in this Art,

To the Reader.

Art, than to my knowledge hath hitherto been. Which perhaps may not seem to be set out in so gallant a dress as some others, but I dare aver to be done with as much plainness, facility and shortness, as any that I have yet observed.

Thus not fearing, Gentle Reader, lest any Man should scorn my Labours, because I seem to undervalue them by letting others have the use, profit and pleasure thereof at so small a rate, I refer my self and them to thy consideration, and if after perusal and trial made, thou kindly accept what I lovingly offer it shall abundantly satisfy him that is devoted to serve God, and profit others in his Calling, and desire to remain,

Ready to pleasure thee, whether
known or unknown to

James Hodder.

The

LS

The Corrector to the Reader.

SINCE this Arithmetick came out, it hath sufficiently demonstrated to the World its Utility and facile Method; and therefore needs no further Commendation than what the Learner (through its easie Instructions) may have cause to give it.

And yet notwithstanding the World hath been fully satisfied with the Method thereof, many have been laid under great discouragements (some through Ignorance blaming the Author) for multitudes of Faults that had crept in by the neglect of the Press; and some by pretending to a perfection in the said Art, before they have attained to it by a practical habit.

Now (Courteous Reader) thou mayest cheerfully go on, all its former Errors being purged from it, and some more Light given to it, being augmented in several places where occasion (for thy sake) did require; and that it may answer thy Expectations is the desire of him who is a Lover of Ingenious Arts,

HENRY MOSE.

To my Ingenious Friend Mr. Henry Mose,
upon his Amendments to Mr. James
Hodder's Arithmetick.

THis Critick Age excludes things Obsolete,
Now nothing takes wanting a Dress com-
Beauty though unadorn'd is Beauty still, (plete.
Enrich'd with Splendor captivates each Will.
So he that would caress this knowing Age,
And means to appear in Print upon the Stage,
(E'v'n in this Harvest time, when Learning, Arts
And Wits are ripe, and the sublimest parts
Are now arriv'd at what they can aspire,
At which Ages to come may well admire,)
Must emulate what hath been done before,
And muster those Acquirements, which in store
Lay dormant. This thy Pen hath fully done ;
Th' hast added to his Fame, and to thy own,
For amplifying his elaborate Piece,
Multiplies thy Worth, not Subtracting his,
Imbellishing the Work, is to create
A lasting progeny in despite of Fate.
The Authors mantle doth intelop thee,
And when the future grateful Age shall see,
That by Accomplishments thou dost inherit
A double portion of thy Masters Spirit ;
Posterity shall make account it ours
To Hodder's Memory, but much more to Mose.

S. HODDER.

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A Table shewing the Contents
of this Book.

CH A P. I.

THE Definition of Numbers and Numeration, with an easie Table thereunto belonging.

Chap. 2. Addition of Money, Measures, Weights, &c.

Chap. 3. Subtraction of Money, Measures, Weights, &c.

Chap. 4. Multiplication, with the use thereof, laid down in a plain and easie Method for young Learners, never before extant.

Chap. 5. Division the common way, and the use thereof; also another kind of Division more brief, easie, and lineal.

Chap. 6. Reduction of Money, Measures, Weights, &c. with very easie ways to find out the Tare and Neat.

Chap. 7. What Fractions are, how express'd, and the several sorts thereof.

Chap. 8. Reduction of Fractions; and why Reduction is before Addition.

Chap. 9. Addition of Fractions the common way, and the two other ways more expedient.

Chap. 10. Subtraction of Fractions.

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Chap. 11. *Multiplication of Fractions.*

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Chap. 13. *The Rule of Three direct and indirect, in whole Numbers, wrought four several ways; with a direction how to work any Question upon the Rule of Three, without troubling the head with the distinction of Direct and Indirect.*

Chap. 14. *The Rule of Three in Fractions.*

Chap. 15. *Practice with very plain and easie Tables.*

Chap. 16. *The Double Rule of Three, consisting of five Numbers.*

Chap. 17. *Very brief Rules for Interest, and Interest upon Interest; also by the help of a plain Table to know what any Sum of Money comes to, Interest upon Interest, for 21 Years or under, at one working by the Rule of Three.*

Another Table to know what any Annuity will amount unto for the same time, at one working by the said Rule.

Chap. 18. *The Rule of Fellowship or Company without time, and fellowship with time.*

Chap. 19. *The Rule of Barter.*

Chap. 20. *Equation of Time for Payment of Money.*

Ch. 21. *Rebate or Discount.*

Ch. 22. *Exchange of Money from one Country to another, and to know at what rate*
the

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the Exchange is made either of Money or Ware.

Chap. 23. To know what is gained or lost per cent. in the sale of any Commodity at such a price; and what it must be sold for to gain or lose so much per cent. Likewise having gained or lost so much per cent. to know what it cost.

And having gained so much per cent. when sold at such a price, what shall be gained or lost when sold at another price.

Chap. 24. Allegation Medial and Alternate

Chap. 25. Instructions for the measuring of any Superficies, as Board, Glass, Hangings, Pavements, &c. As also the Measuring Solids as Timber, Stone, &c.

An Advertisement.

Writing, Arithmetick in whole Number and Fractions, Vulgar and Decimal, and Merchants Accompts, are carefully taught in Sherborn-lane near Lombard-street,

By HENRY MOS



CHAP. I.

The Definition of Number.

A Number is a multitude of Units put together, as 2, 3, 4, 5, 6, &c. Therefore an Unit is properly no Number, but the original or beginning of Number, for it being multiplied or divided by it self, is resolved again into it self, without any increasement or decreasement.

NUMERATION.

Numeration is that part of Arithmetick whereby one may rightly value, express, and write any Number or Sum propounded.

To the attaining whereof observe, that all Numbers are expressed by these Characters following, whose simple value by

B them

themselves considered, you may here take notice of.

one, two, three, four, five, six, seven, eight, nine, cypher

1 2 3 4 5 6 7 8 9 0

The Cypher serveth to make up the number of places, but of itself signifieth nothing.

Every figure hath two values, where one is always certain, and hath its own signification; but the other is uncertain, by reason of the uncertainty of the place where it may happen to stand.

A place we commonly call a space in which a figure standeth; and look how many figures there are, so many places there are by which they are valued.

Every figure in the first place simply be tokeneth it self; but in the second place which is towards the left hand, it is ten times so much as it was in the place before, and so increaseth its value according to its place, as you may see in the Table following.

Numeration Table.

C.	X.	Millions.	C.	X.	Thousand.	C.	X.	Thousands.	Hundreds.	Tens.	Units.	
9	8	7	6	5	4	3	2	1				The first place.
9	8	7	6	5	4	3	2	1				987 mil. 654 thou. 321
	9	8	7	6	5	4	3	2				98 mil. 765 thou. 432
		9	8	7	6	5	4	3				9 mil. 876 thou. 543
			9	8	7	6	5	4				987 thousand. — 654
				9	8	7	6	5				98 thousand — 765
					9	8	7	6				9 thousand — 876
						9	8	7				— — — — 987
							9	8				— — — — 98
								9				— — — — 9

Which you must read beginning from the last place on the left hand, and proceeding to the first at the right, on this manner, viz. Nine hundred eighty Seven millions Six hundred fifty four thousand, Three hundred twenty one.

And for the better understanding of the Table, observe that the first figure next the right hand is the place of Units, and signifies but his own single value; as the figure of 1 but one, 2 but

two, 3 but three, &c. But where two or more figures are joyned together, the figure in the second place towards the left hand betokeneth his own single value ten times; and so in the third place signifies his own value an hundred times; in the fourth place a thousand times.

Example. 6. In the fourth place is six thousand, 6 in the third place is six hundred, 6 in the ninth place is 6 hundred Millions.

And thus you see the value of the figure is according to the place it standeth in.

The names of the places therefore you must be sure to get by heart.

To help you in the expressing of great numbers, you may make a Period or Prick with your Pen between every three figures beginning at the right hand; as in this Example.

123. 456. 789. Here you see is one hundred Twenty three, four hundred fifty six, seven hundred eighty nine. Thus you must express all figures: But to know the value of them, you must begin at the right hand and reckon towards the left, according to the precedent Table, and you will find

find them to be one hundred twenty three millions, four hundred fifty six thousand, seven hundred eighty nine.

There are three sorts of Numbers :

1. A Digit.
2. An Article.
3. A Mixt or Compound.

All numbers not exceeding the nine Units are called Digits ; as 1, 2, 3, 4, 5, 6, 7, 8, 9.

Articles be numbers consisting of a Digit and a Cypher ; as 10, 20, 30, 40, 50, 60, &c.

A Compound is a number consisting of both ; as 13, 14, 15, 16, 17, &c.

CHAP. II.

ADDITION.

Without the lesser Denomination.

BEfore I begin to acquaint you with the working of any of the Rules following, I shall (all along in their proper places) first shew you the nature and meaning of the Rules, and secondly the manner of their Working.

What Addition teacheth.

Addition teacheth you to add two or more Sums together, to make them one whole or total sum, viz.

Examples.

Received at several times these particular Sums following.

At one time	_____	341
At another time	_____	158
More	_____	217
More	_____	596
More	_____	179

I desire to know how }
much was received in all } **1491**

I. For the working of this, and all others of this kind, you must begin with the first or lowermost figure at your right hand, saying, 9, 6, 7, 8, and 1, makes 31; then set down the 1 in a Line underneath, and carry the 3 unto the next place, where 7, 9, 1, 5, 4, and 3 that I carried make 9, which 9 set down, and carry the 2 unto the next place towards your left hand, saying, 1, 5, 2, 1, 3, and 2 that I brought, make 14, which set down. So that you see all the particulars do make 1491.

A general Rule.

For Sums of one Denomination in Addition,

dition, observe to set down all that is above Ten or Tens, and under Ten; and for every Ten carry one to the next place, until you come to the last, which must always be set down, as in the former Example and this following appeareth.

$$\begin{array}{r}
 2734 \\
 3945 \\
 6542 \\
 5753 \\
 9278 \\
 1712 \\
 \hline
 29974
 \end{array}$$

Here I think it not amiss to advise you to be sure for your clearer working, to set down the figures of every rank in a straight line under one another; as you see in the forgoing Sums, Units under Units, Tens under Tens, &c.

Addition of Money with the lesser Denominations.

II. I need not here to acquaint you that four Farthings make a Penny, twelve Pence a Shilling, and twenty Shillings a Pound.

B 4

But

But thus much I desire you to mind in all Additions and Subtractions, the Title of your Account, and how many of the first Denomination do make one of the second, and how many of the second do make one of the third, and how many of the third do make one of the fourth; and so in this manner if there are more. The Observation of this will much facilitate the work, and save both you and me a great deal of labour; therefore I shall only give one or two Examples of each cast up to your hands.

For the effecting of this, consider as before, how many of the first Denomination do make one of the second (which is here 20;) therefore for every 20 Shillings carry one Pound to the Pounds, as thus, 1, 6, 8, 7, and 1 Shilling is 23 Shillings; then come down up in the Tens, and say, 23 and 10 is 33, and ten is 43, and 10 is 53, and 10 is 63, and 10 is 73, and 10 is 83 Shillings; now 83 Shillings being 4 Pounds 3 Shillings, set down only the 3 Shillings, and carry 4 to the next; saying, 9, 1, 8, 1, 7, and 4 that I carried in my mind is 30; set down 0, and carry the 3 to the next, saying, 1, 7, 3, 2, and 3 I carried, is 16; set down 6, and carry

1 to the next, saying, 3, 4, 1, 1, 1, 3, and 1 that I carried is 14; which by reason there is not any other place to carry it unto, only set it down according to this Example.

<i>l.</i>	<i>s.</i>
372—	11
107—	10
100—	17
138—	18
471—	16
313—	11
<hr/>	
1460—	3

As before, so again consider the Title of your Account, and how many of the one do make the other; then begin with the first figures at your right hand, 5, 7, 1, 8, and 1; which being added together make 22, and coming down upon the Tens, say, 22 and 10 is 32, and 10 is 42, and 10 is 52 (and so on if there were more.) Now consider how many Shillings 52 Pence make, viz. 4 Shillings and 4 Pence; set down the 4 Pence, and carry the 4 Shillings to the Shillings, saying 4 that I carry and 8 is 12, and 7 is 19, and 1

is 20, and 3 is 23, and 6 is 29, and 1 is 30; then come down upon the Tens, 40, 50, 60, 70, 80, and 10 is 90 Shillings, which is 4 Pounds 10 Shillings; set down the 10 Shillings and carry the 4 Pounds to the Pounds, saying 4 and 6 is 10, and 1 is 11, and 5 is 16, and 7 is 23, and 1 is 24, which 4 set down, and carry the 2 unto the 9, which will make 11, and 4 is 15, and 6 is 21, and 4 is 25, and 1 is 26, and 1 is 27, which set down; and the total amounts to 274 *l.* 10*s.* 4*d* as you may see in the Example.

<i>l.</i>	<i>s.</i>	<i>d.</i>
11	11	11
10	16	08
47	13	10
65	11	11
41	17	07
96	18	05
<hr/>		
274	10	04

You may make a Prick with your Pen at every 4 in the Farthings, and at every 12 in the Pence, and at every 20 in the Shillings. But this way is neither so neat nor commendable; for if you once prick false, you must prick it all over again, which will look

look like so many Blots, and make you more subject to mistake.

Therefore I recommend these two Tables following to you to be gotten perfectly by heart, before you adventure upon Addition, as 1 Shilling is 12 Pence, 2 Shillings is 24 Pence, and so on.

s.	d.	d.	s.	d.
1	— is — 12	20	— is — 1	8
2	— is — 24	30	— is — 2	6
3	— is — 36	40	— is — 3	4
4	— is — 48	50	— is — 4	2
5	— is — 60	60	— is — 5	0
6	— is — 72	70	— is — 5	10
7	— is — 84	80	— is — 6	8
8	— is — 96	90	— is — 7	6
9	— is — 108	100	— is — 8	4
10	— is — 120	110	— is — 9	2
11	— is — 132	120	— is — 10	0
12	— is — 144			

Note that

The Proof of Addition.

Add all the Sums again except the uppermost, which is here 300l. 11s. 6d. 2q. and then add the Total thereof unto the said uppermost line, and if it make the just Sum of the first Total, it is true, otherwise not.

Example

Example.

l. s. d. qrs.

300—11—06—2

102—15—11—1

106—17—10—0

241—18—11—1

601—11—11—1

314—10—10—2

611—11—11—1

Total ————— 2279—19—00—0

1979—07—05—2

Proof ————— 2279—19—00—0

Addition of Cloth Measure

III. Note that 4 Nails is 1 Quarter of a Yard, 1 Yard 4 Quarters, 1 Ell Flemish 3 Quarters of a Yard, 1 Ell English 5.

You see the Title of your Account is Yards, Quarters and Nails; now observe how many Nails make one Quarter, which is 4; therefore for every 4 carry 1 Quarter to the Quarters; and likewise for every 4 Quarters, which make a Yard, carry

ry 1 Yard to the Yards *yard qua. na.*
 and in the Yards (or last
 Denomination, of any
 Addition) for every 10
 carry 1 to the next place,
 until you come to the
 last rank; which Total
 set down, as in these Ex-
 amples.

371	—1—	1
106	—3—	2
410	—2—	3
716	—3—	1
151	—2—	3
171	—1—	2
412	—1—	1
601	—3—	2
912	—1—	3
<hr/>		
3855	—1—	2

yard qr. na. El. Eng. qr. na. El. Fle. qr. na.

31—1—2	47—1—2	54—1—2
27—2—3	— — —	16—2—1
14—1—2	31—2—3	31—1—2
16—1—3	41—4—3	91—2—3
35—3—1	17—1—2	31—2—1
27—2—0	38—3—1	— — —
— — —	27—1—0	226—1—1
153—0—3	— — —	— — —
— — —	203—4—3	
	— — —	
	156—3—1	
	— — —	
Proof. — — —	203—4—3	

Addition of Wine Measure.

IV. The same order that is set down in the second Section of this Chapter, is here to be observed, and likewise in all the Additions following.

Example.

For 2 Pints carry 1 Quart, for 2 Quarts a Pottle, for 2 Pottles 1 Galon, for 63 Gallons 1 Hogshead, for 4 Hogsheads 1 Tun.

Tuns. hogsh. gall. pot. qrs pints.

321—1—16—1—0—1

102—1—10—1—1—0

317—1—15—0—1—1

241—2—30—1—0—1

317—1—40—1—1—1

171—3—10—0—1—1

141—2—10—1—0—1

131—1—17—1—1—0

Total 1745—0—27—0—0—0

1423—1—10—0—1—1

1745—0—27—0—0—0

Ad.

Addition of Troy Weight.

For 24 Grains carry 1 Penny weight, for 20 Penny weight 1 Ounce, for 12 Ounces 1 Pound.

lb	℥	pw.	gr.	lb	℥	pw.	gr.
371	11	19	23	41	10	17	10
102	10	10	11	31	11	14	11
413	11	16	10	10	10	15	15
176	03	19	11	11	11	11	10
912	10	18	0	10	10	17	16
341	11	13	22				
<hr/>				<hr/>			
2320	00	18	15	107	07	26	14
<hr/>				<hr/>			

Addition of Averdupoize Weight.

For 16 Ounces carry 1 Pound, for 28 Pounds carry 1 Quarter, for 56 Pounds 2 Quarters, for 84 Pounds 3 Quarters, for 112 Pounds 4 Quarters (or one Hundred Weight) for 20 Hundred 1 Tun.

Example.

C. qrs. lb 3	Tuns C. qrs. lb 3
91—3—27—15	91—19—3—17—15
10—1—16—14	16—11—1—11—14
11—2—10—10	91—11—2—11—11
31—1—11—12	60—11—3—10—11
71—1—11—10	31—10—2—11—13
10—3—15—11	78—11—1—13—13
<hr/>	41—11—2—11—11
227—2—10—08	<hr/>
<hr/>	

Addition of Dry Measures.

For 16 Pints carry 1 Peck, for four Pecks carry
1 Bushel.

bushels	pecks	pints	bushels	pecks	pints
317	—1—	10	400	—1—	10
102	—3—	11	103	—2—	10
413	—2—	10	710	—1—	11
171	—1—	11	317	—1—	10
15	—3—	10	106	—3—	11
<hr/>	<hr/>		<hr/>	<hr/>	
1112	—1—	04			

Addition of Time.

For 60 Minutes carry one Hour, for 24 Hours
one Day, for 365 Days one Year.

years	days	hours	min.
37	150	11	12
31	110	10	10
14	175	15	23
10	101	11	11
11	137	12	14
10	101	11	13

115 — 046 — 23 — 23

Addition of Long Measure.

For 12 Inches carry one Foot, for three Feet
one Yard.

yards	feet	inches	yards	feet	inches
18	1	10	300	2	11
17	2	11	101	1	10
10	2	07	602	2	11
31	1	10	101	1	10
41	2	11	101	0	08
10	0	10	710	1	11
			810	2	10
194	0	11			

CHAP. III.
SUBTRACTION
of Money.

Subtraction teacheth to take any lesser Number out of a greater, and how to know what remains.

I. *Subtraction of one Denomination.*

First, set down the great number from which you would subtract, and then place the lesser number to be subtracted under it, as in Addition with a Line drawn beneath them.

Example.

Received — 379
Laid out — 136
—

Then take the first figure towards the right hand in the Sum to be subtracted from the figure over it; as 6 from 9 and there remains 3, which 3 set down; then 3 from 7 and there remains 4. Lastly, 1 from 3 and there remains 2, which 2 set down.

379
136
—

And there remains unpaid — 243

But

But I shall give you one or two Examples, wherein the figures of the Sum to be subtracted, are some of them greater and some lesser than those you must subtract from; therefore if there be only one Denomination, borrow 10 and add to the upper figure; as in this example.

Received———130624

Paid out———104146

Remaineth———026478

Say 6 from 4 I cannot, but 6 from 14 and there remains 8, which set down; 1 that I borrowed and 4 makes 5, 5 from 2 I cannot, but 5 from 12 I may take, and there remains 7; which 7 set down. Then 1 that I borrowed and 1 is 2, 2 from 6 and there remains 4; now 4 from 0 I cannot, but 4 from 10 and there remains 6; then 1 that I borrowed and 0 is 1 now 1 from 3 and there remains 2. Then lastly 1 from 1 and there remains 0.

So that if you take 104146 from 130624 there remains 26478.

II. Subtraction of several Denominations.

But if there be several Denominations, then observe as before in Addition of Money, how many of the first make one of the second, and so on. And if the figure or figures be greater than those you are to subtract from, borrow one from the next Denomination, and subtract from it; and add the Remains to the upper figure.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Received	—275—	—11—	—03
Laid out	—196—	—12—	—05
	<hr/>		
Remains	—078—	—18—	—10

Example. Take 5*d.* from 3*d.* I cannot, but 5*d.* from a Shilling or 12. and there remains 7*d.* which added to the 3 makes 10*d.*

Again, one Shilling that I borrowed (for you must be sure to pay what you borrow) and 12 is 13, which to take from 11 I cannot; then say 13*s.* from 20*s.* and there remains 7, and the 11 makes 18, which set down.

Again,

Again, ¹ that I borrowed and 6 is 7; now 7 from 5 I cannot, but 7 from ¹5 and there remains 8. Then ¹ that I borrowed and 9 is 10; now 10 from 7 I cannot, but 10 from ¹7 and there remains 7, which set down, Then ¹ that I borrowed and 1 is 2; 2 from 2 and there remains nothing

	l.	s.	d.
So that —————	196	12	5
being taken from —————	275	11	3
there remains —————	078	18	10

And thus in any other of this nature, observe that the same that you carried in Addition, the same you must borrow in Subtraction; as 12 in the Pence; 20 in the Shillings, and 10 in the last Denomination.

I need say no more, only I shall acquaint you how to know whether your Work be well done or no.

Proof of Subtraction.

Add the Remains to the Sum subtracted, and if it make the same Sum with that which you did subtract, it is true, else not. As in the last Example, 78l. 18s 10d. and 196l. 12s. 5d. being added, do make the same Sum with the Sum received.

Sub-

Subtraction of Cloth Measure.

<i>Yards.</i>	<i>qrs.</i>	<i>na.</i>	<i>Ells Flegm.</i>	<i>qrs.</i>	<i>na.</i>
Bought—	37	12—1—2	Bo.—	41	71—2—1
Sould—	19	13—2—1	So.—	13	17—2—3
<hr/>					
P.e.—	17	98—3—1	Re.—	28	53—3—2
<hr/>					
Proof.—	37	12—1—2			

	<i>Ells Eng.</i>	<i>qrs.</i>	<i>na.</i>
Bought—	47	16	210—2—1
Sold—	10	913	17—3—3
<hr/>			
Remains—	36	24	892—3—2
<hr/>			

*Subtraction of Averdupoize.
Weight.*

For the better understanding of the Rule observe (as you did before) the Title of your Account; and where you cannot take one number out of another, take it out of the next Denomination; as you see here, 10 from 10 I cannot, but 12 Drains from 1 Ounce there resteth 4, and the 10 make

14; 14 from 11 I cannot, but 14 from 16 and there remains 2; 2 and 11 is 13. Now 1 that I borrowed and 14 is 15; 15 from 11 I cannot, but 15 from 28 and there remains 13; 13 and the 11 is 24. Now 1 that I borrowed and 3 is 4; 4 from 2 I cannot, but 4 from 4 and there remains nothing, but 2 is 2, which you must set down. Now 1 that I borrowed and 8 is 9; 9 from 7 I cannot, but 9 from 17 and there remains 8. Now 1 that I borrowed and 1 is 2, 2 from 4 and there remains 2.

	C.	qr.	lb	oz.	dr.
Bought	—4—	—2—	—11—	—11—	—10
Sold	—18—	—3—	—14—	—13—	—12
<hr/>					
Remains	—28—	—2—	—24—	—13—	—14
<hr/>					

Subtraction of Cloth Measure.

<i>Yards.</i>	<i>qrs.</i>	<i>na.</i>	<i>Ells Flegm.</i>	<i>qrs.</i>	<i>na.</i>
Bought—	37	12—1—2	Po.—	41	71—2—1
Sould—	19	13—2—1	So.—	13	17—2—3
<hr/>					
P.e.—	17	98—3—1	Re.—	28	53—3—2
<hr/>					
Proof.—	37	12—1—2			

	<i>Ells Eng.</i>	<i>qrs.</i>	<i>na.</i>
Bought—	47	16	210—2—1
Sold—	10	913	17—3—3
<hr/>			
Remains—	36	248	92—3—2
<hr/>			

*Subtraction of Averdupoize.
Weight.*

For the better understanding of the Rule observe (as you did before) the Title of your Account; and where you cannot take one number out of another, take it out of the next Denomination; as you see here, 10 from 10 I cannot, but 12 Drams from 1 Ounce there resteth 4, and the 10 make

14; 14 from 11 I cannot, but 14 from 16 and there remains 2; 2 and 11 is 13. Now 1 that I borrowed and 14 is 15; 15 from 11 I cannot, but 15 from 28 and there remains 13; 13 and the 11 is 24. Now 1 that I borrowed and 3 is 4; 4 from 2 I cannot, but 4 from 4 and there remains nothing, but 2 is 2, which you must set down. Now 1 that I borrowed and 8 is 9; 9 from 7 I cannot, but 9 from 17 and there remains 8. Now 1 that I borrowed and 1 is 2, 2 from 4 and there remains 2.

	C.	qr.	lb	oz.	dr.
Bought	—4—	—2—	—11—	—11—	—10—
Sold	—18—	—3—	—14—	—13—	—12—
<hr/>					
Remains	—28—	—2—	—24—	—13—	—14—
<hr/>					

CHAP. IV. MULTIPLICATION.

The Multiplication Table.

2 times	{ 2 4 5 6 7 8 9 }	{ 2 4 5 6 7 8 9 }	{ 4 6 8 10 12 14 16 18 }	5 times	{ 5 9 }	is	{ 25 30 35 40 45 }
3 times	{ 3 4 5 6 7 8 9 }	{ 3 4 5 6 7 8 9 }	{ 9 12 15 18 21 24 27 }	6 times	{ 6 7 8 9 }	is	{ 36 42 48 54 }
4 times	{ 4 5 6 7 8 9 }	{ 4 5 6 7 8 9 }	{ 16 20 24 28 32 36 }	7 times	{ 7 8 9 }	is	{ 49 56 63 }
5 times	{ 5 6 7 8 9 }	{ 5 6 7 8 9 }	{ 25 30 35 40 45 }	8 times	{ 8 9 }	is	{ 64 72 }
6 times	{ 6 7 8 9 }	{ 6 7 8 9 }	{ 36 42 48 54 }	9 times	{ 9 }	is	{ 81 }
7 times	{ 7 8 9 }	{ 7 8 9 }	{ 49 56 63 }	10 times	{ 10 }	is	{ 100 }
8 times	{ 8 9 }	{ 8 9 }	{ 64 72 }	11 times	{ 11 }	is	{ 121 }
9 times	{ 9 }	{ 9 }	{ 81 }	12 times	{ 12 }	is	{ 144 }

I. For

1. **F**OR the clearer understanding of this Table, observe the Figures in the Margin, 2, 3, 4, &c. and the word [times] adjoyning to them; say 2 times 2 is 4, 2 times 3 is 6, 2 times 4 is 8, 2 times 5 is 10, &c. After you know well how to read it within Book, you must of necessity get it very perfectly by heart, before you can make any farther progress in this Art.

The use of Multiplication.

Multiplication serveth instead of many Additions, and teacheth of two Numbers given to increase the greater as often as there are Units in the lesser.

There are three things strictly to be observed, viz.

1. The *Multiplicand*, or Sum to be multiplied.
2. The *Multiplier*, or Sum by which you multiply.
3. The *Product* or Sum produced.

Ask how much is 7 times 52, or in 52 weeks how many days there are?

If you would add 7, 52 times, it would
C
be

be a tedious work ; but Multiplication will do that at once, that Addition should do at many times. In Multiplication therefore first set down the greatest number and the lesser under it, beginning at the right hand, and multiply every figure of the Multiplicand by each figure of the Multiplier, then (do as in Addition) set down all that is under ten, or above ten, or tens, and for every ten (or Article) carry one to the next place, and in the last place set down the tens.

Example.

52 *Multiplicand.*

7 *Multiplier.*

364 *Product.*

Begin with the Multiplier, saying, times 2 is 14, set down the 4 under 7, and carry 1 to the next place, saying, 7 times 5 is 35, and one that I carried is 36, which set down as you see in the Example: so that 7 times 52 is 364.

In 3712 Shillings how many Farthings or how much is 48 times 3712?

Be careful in setting the figures of the Multiplier under the Multiplicand; for
units

unites must be under unites, tens under tens, hundreds under hundreds; and having rightly placed your figures; then proceed according to your former Example, saying, 8 times 2 is 16, set down 6 and carry 1 to the next place, saying 8 times 1 is 8, and 1 that I carried is 9, set down 9, and carry nothing, saying 8 times 7 is 56, set down 6, and carry 5 to the next place, saying, 8 times 3 is 24, and 5 is 29, which set down. And having done with the first

$$\begin{array}{r} 3712 \\ 48 \\ \hline \end{array}$$

$$29696$$

figure of the Multiplier, cancel it with a dash of the Pen,

$$\begin{array}{r} 3712 \\ 48 \\ \hline \end{array}$$

and proceed to the next, saying, 4 times 2 is 8, which 8

$$29696$$

set down directly under the Multiplier, then say 4 times

$$14848$$

1 is 4, which set down, then 4 times 7 is 28, which 8 set

$$178176$$

down, and carry 2, then 4 times 3 is 12, and 2 that I

carried is 14, which being set down, you shall find 48 times 3712 to be 178176.

How to Multiply by 10, 100, 1000, 1000.

Look how many Cyphers you have in your Multiplier, add them to your Multiplicand, and the total thereof shall be the product.

Ex. mple.

Multiply	{	63	by	10	{	facit	630
		36		100			3600
		85		1000			85000
		92		10000			920000
		73		100000			7300000

How to Multiply by 20, 40, 300, 5000, &c.

As many Cyphers as there are in the Multiplier, set them down towards the right hand, and multiply the rest as before is taught.

Example.

37	232
20	300
740	69600

How to prove Multiplication.

First cast away the nines of the Multi-
plicand (in your former example) 3712,
saying, 3 and 7 is 10, cast away 9, and there
remains 1; then 1 and 1 is 2, and 2 is 4,
which set on the right side of a cross;
thus $\begin{array}{c} \times \\ 4 \end{array}$.

Then cast away the nines of the Multi-
plier, saying, 4 and 8 is 12, cast away
the nine, and there remains 3, which,
place on the left side thus $\begin{array}{c} 3 \\ \times \\ 4 \end{array}$; then
multiply the one by the other, saying, 3
times 4 is 12, cast away nine, and there
remains 3, which place at the top of the
cross thus,

$$\begin{array}{c} 3 \\ 3 \times 4 \end{array}$$

Lastly cast away the nines of the Pro-
duct, saying 1 and 7 is 8, and 8 is 16,
cast away nine, and there remains 7; then
7 and 1 is 8, and 7 is 15; cast away nine
and there remains 6; then 6 and 6 is 12,
cast away nine and there remains 3, which
place at the bottom of the cross, and if the
top figure and the bottom be like, your
work may be true.

This is the common way to prove Mul-
tiplication; But the most certain proof

C 3

is

is by Division, as hereafter I will shew you

II. Yet for the more perfect understanding of Multiplication, I have here laid it down in the Nature of the *Golden Rule*, which though it be not according to the usual Method of Teaching, yet the experience I have had thereof, sheweth me, that it will inform any one more thoroughly in the Nature of this Rule, than any directions I have yet read; for tryal hereof take sundry Examples, wrought only by multiplying second and third numbers together, as these following.

Example.

If 1 yard cost 17d. what cost 40 yards?

$$\begin{array}{r} 17 \\ \hline 280 \\ 40 \\ \hline \end{array}$$

facit 680d.

If one Pound cost 19d. what cost 112l?

$$\begin{array}{r} 19 \\ \hline 1008 \\ 112 \\ \hline \end{array}$$

facit 2128

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If 1 Shilling make 12*d.* what will 20*s*?

20

facit 240*d.*

If 1 shilling make 48*q.* what will 20*s*?

20

facit 960 *farthings.*

If 1 Crown be 60*d.* what 500 Crowns?

60

30000*d.*

If 1 Yard be 16 Nails, what 576 Yards?

16

3456

576

9216 Nails.

If 1 Ell Eng. make 20 Nails, what 246 Ells?

20

facit 4920 *Na.*

If 1 Gallon makes 8 Pints, what 63 Gall.

8

facit 504 *Pints.*

If 1 Hogsh. make 63 Gall. what 4 Hogsh.

4

t 252 *Gall.*

C 4

If

If 1 tun make 252 gallons, what 20 tun

$$\begin{array}{r} 20 \\ \hline \text{facit } 5040 \text{ gallons} \end{array}$$

If 1 inch be 3 barley Corns, what 1 inches?

$$\begin{array}{r} 3 \\ \hline \text{facit } 3 \end{array}$$

If 1 foot be 12 Inches, what 379 feet?

$$\begin{array}{r} 12 \\ \hline \text{facit } 4548 \end{array}$$

If 1 yard be 3 feet, what 478 yards?

$$\begin{array}{r} 3 \\ \hline \text{facit } 1434 \end{array}$$

If 1 furlong be 40 poles, what 846 furlongs?

$$\begin{array}{r} 40 \\ \hline \text{facit } 33840 \end{array}$$

If 1 mile be 8 furlongs, what 100 miles?

$$\begin{array}{r} 8 \\ \hline \text{facit } 800 \end{array}$$

If 1 pound be 12 ounces, what 176 pounds.

$$\begin{array}{r} 12 \\ \hline \text{facit } 2112 \end{array}$$

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If 1 ounce be 20 peny weight, what 12 ounces?

$$\begin{array}{r} 20 \\ \text{facit } 240 \end{array}$$

If 1 peny weight be 24 grains, what 20 peny weight?

$$\begin{array}{r} 20 \\ \text{facit } 480 \end{array}$$

If 1 pound be 16 ounces, what 112 pound?

$$\begin{array}{r} 16 \\ \hline 672 \\ 112 \\ \hline \text{facit } 1792 \end{array}$$

If 1 quarter be 28 pound, what 4 quarters?

$$\begin{array}{r} 4 \\ \text{facit } 112 \end{array}$$

If a C. be 112 pound, what 20 C?

$$\begin{array}{r} 20 \\ \text{facit } 2240 \end{array}$$

If 1 Tun be 20 C. what 846 Tuns?

$$\begin{array}{r} 20 \\ \text{facit } 16920 \end{array}$$

If 1 C. gross alloweth 15 pound tare
what will 72 C. gross?

$$\begin{array}{r} 15 \\ \hline 360 \\ 72 \\ \hline \end{array}$$

facit 1080 tare.

If 1 C. gross give 13 pound tare
what will 96 C. gross give?

$$\begin{array}{r} 13 \\ \hline 288 \\ 96 \\ \hline \end{array}$$

facit 1248

If 1 Doller be 56d. what 500 Dollers?

$$\begin{array}{r} 56 \\ \hline 3000 \\ 2500 \\ \hline \end{array}$$

facit 28000 pence.

If 1 French Crown be 6s. what 866?

$$\begin{array}{r} 6 \\ \hline \text{facit } 5196 \end{array}$$

If 1*l.* cost 37*d.* what cost 475*l.*

$$\begin{array}{r} 37 \\ \hline 3325 \\ 1425 \\ \hline \end{array}$$

facit 17575

CHAP. V.

DIVISION.

Division is that by which we know how many times a lesser Sum is contained in a greater.

The Parts of Division.

In Division observe, {

1. The *Dividend*.
2. The *Divisor*.
3. The *Quotient*.
4. The *Remain*.

1. The *Dividend* is the Sum to be divided.
2. The *Divisor* is the Sum by which we divide.
3. The *Quotient* is the Sum produced, and containing so many times the *Divisor*, as it self is in value.

4. The

4. The *Remain* is always less than the *Divisor*.

First, Set down the Dividend, and right under it towards the left hand the Divisor.

Example.

Being to divide 4648 half pence by the number of half pence in a penny.

I first set down the Dividend, and then the Divisor under the first figure thus :

$$\begin{array}{r} 4648 \\ 2 \end{array}$$

But if the figure or figures just over the Divisor be lesser than the figures under it the Divisor must be removed one degree or place more towards the right hand.

Example.

I would divide 4648 farthings by 48, the number of farthings in a shilling, then I must set my Divisor thus :

$$\begin{array}{r} 4648 \\ 48 \end{array}$$

And at the end of the two numbers make a crooked Line wherein to include the Quotient thus (

Yet before you begin your work, consider three things, viz.

1. Seek how often the Divisor is contained in the Dividend.

2. Multiply the Quotient and Divisor together

3. Sub

3. *Subtract the Product from the Dividend.*

To propound then the former Example.

In 46,8 half-pence, if I would know how many pence.

$$\begin{array}{r} 4648 \text{ (2} \\ \times \end{array}$$

I must seek how many times 2 is contained in 4, which is twice; then I set 2 in the Quotient, and multiply it by the Divisor, saying 2 times 2 is 4; now 4 from 4, and there remains nothing; which 2 having performed its first office, I cancel with a dash of the Pen, and remove it one place nearer the right hand thus:

$$\begin{array}{r} 4648 \text{ (23} \\ \times 2 \end{array}$$

Then I say again, how many times 2 is 6? which is 3 times; I set down 3 in the Quotient, and multiply by 2, saying, 3 times 2 is 6; now 6 from 6, and there remains 0.

Again I remove the Divisor, thus:

$$\begin{array}{r} 4648 \text{ (23} \\ \times 2 \end{array}$$

Thus

Thus, and try how many times 2 in 4, which is two times, therefore I set 2 in the *Quotient*, and multiply it by 2 (the Divisor saying 2 times 2 is 4, now 4 from 4, and there remains 0.

$$\begin{array}{r} 46 \div 2 \quad (232 \\ \underline{xx} \end{array}$$

Again, I remove the Divisor, and try again how often 2 is contained in 8; which is 4 times, I set 4 in the *Quotient* and multiply it by 2, saying 4 times 2 is 8: now 8 from 8 and there remains 0.

$$\begin{array}{r} 46 \div 2 \quad (2324 \\ \underline{xxxx} \end{array}$$

Another Example with one Figure.

Suppose there is 398 pounds to be equally divided between 6 Men, the demand is what each Man must have?

First I set down the Dividend 398, and 6 (the Divisor) under 9 thus, because I cannot take 6 out of 3.

$$\begin{array}{r} 398 \div 6 \\ 6 \end{array}$$

Then I try how many times 6 I can have in 39, which is 6 times, I place 6 in

in the Quotient beyond the crooked line, saying, 6 times 6 is 36; now 36 from 39, and there remains 3, which I set down over the 9, and cancel the 39 and 6, my Divisor, thus,

$$\begin{array}{r} 3 \\ 398 \overline{) 6} \\ 6 \end{array}$$

Again, I remove my Divisor to the next place under 8, and seek how many times 6 I can have in 38, which is also 6 times, I set 6 in the Quotient, saying, 6 times 6 is 36, 36 from 38, and there remains 2, which 2 I set over the 8, and cancel my 6 thus?

$$\begin{array}{r} 3 \ 2 \\ 398 \overline{) 66} \\ 66 \end{array}$$

So that every Man must have 66l, and 2l. over, which I may turn into pence, and divide also by 6, and the Quotient will be 80 pence, which is in all 66 pound 6 shillings and 8 pence a piece.

This Order I observe to divide by one Figure, but if the Divisor do consist of more figures than one, I must take the first figure of the Divisor no oftner out of the Dividend than

then I can also take all the rest of the Divisors out of the Dividend that stands above them, as in the Examples following may appear.

But before you proceed to divide by 2 Figures or more, be careful to understand well how to divide by one.

How to prove Multiplication.

In Multiplication I told you, that the most certain proof for that Rule, was by Division; I shall therefore take the Product of one of the Multiplications before going, and divide it by the Multiplier thereof, to try the former work; as for Example.

I would divide 178176 by 48, which was one of the former Products in Multiplication, which numbers place as in the Example following.

$$\begin{array}{r} 178176 \text{ (} \\ 48 \end{array}$$

First I seek how many times 4 is contained in 17, which I find 4 times; now 4 times 4 is 16; 16 from 17, and there remains 1, which makes the 8 to be but 18; now 4 times 8 is, 32, 32 from 18 I cannot, therefore 4 times is too much.

2. I seek whether 3 times will do it, saying, 3 times 4 is 12; now 12 from 17, and there remains 5, which makes the 8 to be 58; then I say 3 times 8 is 24, now 4 from 8, and there remains 4, then 2 (that I carried) from 5, and there remains 3.

$$\begin{array}{r} 3 \\ 84 \\ \times 78176 \quad (3 \\ \hline 48 \end{array}$$

3. I remove the Divisor one place nearer the right hand, saying, how many times 4 in 34, which is 7 times (because 9 or 8 times are too many) then 7 times 4 is 28; now 28 from 34, and there remains 6; then 7 times 8 is 56; 6 from 1 I cannot, but 6 from 11, and there remains 5; then 5 I carried, 1 I borrowed is 6, now 6 from 6, and there remains nothing.

$$\begin{array}{r} 36 \\ 845 \\ \times 78176 \quad (37 \\ \hline 458 \\ \hline 4 \end{array}$$

Again, I remove the Divisor, saying, how

how many times 4 in 5, which is once; then I say once 4 is 4. Now 4 from 5 and there remains 1. Then once 8 is 8; now 8 from 17 and there remains 9, and 1 that I borrowed from 1, there remains nothing.

$$\begin{array}{r}
 364 \\
 8489 \\
 178176 \quad (371 \\
 +888 \\
 44
 \end{array}$$

Again, I remove the Divisor, and seek how many times 4 is in 9, which is twice; saying, 2 times 4 is 8, now 8 from 9 and there remains 1. Then 2 times 8 is 16; now 16 from 16, and there remains nothing. So that I find the Quotient to be 3712, the same as the Multiplicand was in the Multiplication, which is a most certain proof of that Rule.

How to prove Division.

$$\begin{array}{r}
 3644 \\
 8489 \quad (0 \\
 178176 \quad (3712 \\
 +8888 \\
 48 \\
 444 \quad 29696 \\
 14848 \\
 \hline
 \text{Proof} \quad 178176
 \end{array}$$

And

And as Division is a sure proof of Multiplication, so Multiplication is the surest proof of Division, which is performed by multiplying the Quotient with the Divisor; and if the product thereof be the same with the Dividend, your Division is well wrought, otherwise be sure some error is committed in your work.

Also if any figures remain after your Division is ended, they must be added into the Product of your Multiplication, according to their several places, and then (if true) the Total will be likewise the same with the Dividend; as for example doth appear in the last sum of this Rule.

*A more easie way of Division, and
with few figures.*

There are 4648 shillings to be equally divided betwixt 34 Men: I demand what is each Mans proportion.

I will not stand to shew you more of this common way of Division, which is indeed very tedious and burthensome to the memory, and hath caused (to my knowledge) many to despair of attaining it, and so
pro-

proceeding further in this Art. But proceeding by the Method following, which will enable one to go on with far more ease and delight than commonly is seen.

The Question being stated, is to be set thus.

$$4684 \text{ (}$$

$$34$$

Wherein consider how often 34 is contained in 46, which is once (or rather see first how often 3 is contained in 4, which likewise is once) then set 1 in the Quotient, saying, once 4 is 4; now 4 from 6, and there remains 2; which 2 set directly over its dividend.

$$12$$

$$46 \text{ (1}$$

$$34$$

Then go backward to the next, saying once 3 is 3, from 4 and there remains 1, which also set over the 4, and cancel it, and 3 the Divisor, with a dash of the Pen, as you see in the *Example*.

Then remove the Divisors one degree further towards the right hand thus:

$$12$$

$$4684 \text{ (1}$$

$$34 \text{ 4}$$

$$3$$

Then

Then consider how often 3 is contained in 12, which is 4 times; but 4 times the next Divisor cannot be taken out of 8, and you must never take one of the Divisors

finer than you can take all the rest; seeing then 4 times

is too much, try (in your

mind) whether each Divisor

can be taken 3 times, if so,

then place 3 in the Quoti-

ent, saying, 3 times 4 is 12,

12 from 8 I cannot, but 12 from 18 and

there remains 6; then 3 times 3 is 9, and

1 that I carryed is 10, 10 from 12 and

there remains 2.

Again, remove your Divisor towards your right hand : thus

$$\begin{array}{r}
 2 \\
 \times 6 \\
 \hline
 4684(13 \\
 3444 \\
 \hline
 33
 \end{array}$$

Then consider how often 3 is contained in 26, which is 8 times, and 8 times 3 is 24; now 24 from 26, and there remains 2, which 2 will make the next figure to be but 24; then 8 times 4 is 32, 32 out of 24 cannot be,

and

and therefore say, 8 times is too much, which seeing so: try (in your mind) whether 7 will do it, saying 7 times 4. is 28; 28 from 4. I cannot, but 28 from 34, and there remains 6. Then 7 times 3 is 21 and 3 that I carried is 24; 24 from 26, and there remains 2. Cancel out the Dividend and Divisor, and set the remains over head; and your work is done.

$$\begin{array}{r}
 \times (2 \\
 126 (6 \\
 4684 (137 \\
 3444 \\
 \hline
 33
 \end{array}$$

The Quotient sheweth that 34 Men must have 137 shillings a piece, and 26 shillings over and above to be divided amongst them:

Which Remainders, and all others of any Division, I shall shew you what they are when you practice Fractions, as the place more convenient and proper.

4 Example.

There is a Ship taken by 346 Sea-men, which is value at 87654l. to be equally divided

divided amongst them, I demand what each Man as he have.

$$\begin{array}{r} 876546 \\ 346 \end{array}$$

Consider how many times 346 is contained in 876, which is two times; or rather how often 3 is contained in 8, which is likewise 2 times; set 2 in the Quotient, and say 2 times 6 is 12, 12 from 6 I cannot, but 12 from 16 and there remains 4.

Then 2 times 4 is 8, and 1 that I borrowed is 9; 9 from 7 I cannot, but 9 from 17 and there remains 8. Then 2 times 3 is 6, and 1 is 7; 7 from 8 and there remains 1. Then having done with the Divisors, remove them to the next place towards the right hand, thus;

Then say, how many times 3 in 18, 6 times; but that being too much (because all the rest cannot be taken so often) therefore say, 5 times 6 is 30, 30 from 51 cannot, but 30 from 35 and there remains 5.

Then 5 times 4 is 20, and 3 that I borrowed

$$\begin{array}{r} 184 \\ 87654 \quad (2 \\ 346 \end{array}$$

$$\begin{array}{r} 184 \\ 87654 \quad (2 \\ 3466 \\ 34 \end{array}$$

rowed is 23; 23 from 4 I cannot, but 23 from 24, and there remains 1.

$$\begin{array}{r}
 11 \\
 28 \times 5 \\
 8765 \times (25 \\
 3466 \\
 34
 \end{array}$$

Then 5 times 3 is 15, and 2 that I borrowed is 17; 17 from 18, and there remains 1.

Again remove the Divisors (pondering in your mind) how many times 3 can I have in 11, three times; by which I perceive 3 will do it, therefore place it in the Quotient, saying, 3 times 6 is 18; 18 from 4 I cannot, but 18 from 24, and there remains 6: then 3 times 4 is 12, and two that I carried is 14; 14 from 5 I cannot, but 14 from 15, and there remains 1: Then 3 times 3 is 9, and 1 that I carried is 10: 10 from 11, and there remains 1.

$$\begin{array}{r}
 12 \\
 28 \times 1 \\
 2845 \times 6 \\
 8765 \times (253 \\
 34666 \\
 344 \\
 3
 \end{array}$$

5 Example.

There is a City taken in the Wars by 9034 Souldiers that is worth 73062421. I demand what each Souldier must have.

7306242 (

9034

Here you see that 9034 cannot be contained in 7306, therefore remove your Divisor to the next place toward the right hand thus :

7306242

9034

1. Consider how many times 9 can be had in 73, which is 8 times, place 8 in the Quotient, saying 8 times 4 is 32, 32 out of 2 I cannot, but 32 out of 32, and there remains 0.

Then 8 times 3 is 24, and 3 that I borrowed is 27, 27 from 6 I cannot, but 27 from 36, and there remains 9.

Then 8 times 0 is 0, but 3 that I carried is 3; 3 from 10, and there remains 7.

790

~~7306242~~ (8

9034

Then 8 times 9 is 72, and 1 that I borrowed is 73; 73 from 73, and there remains 0.

D

Again

Again remove your Divisor.

Here you also see, that 9034 the Divisor cannot be taken out of the Dividend; therefore cancel it, and remove it to the next place, setting a Cypher in the Quotient.

$$\begin{array}{r}
 790 \\
 7986242 \text{ (80} \\
 98344 \\
 983
 \end{array}$$

Then try again how often the Divisor is contained in the Dividend, which is 8 times.

Then say, 8 times 4 is 32; 32 out of 2 cannot, but 32 out of 32 and there remains nothing.

Then 8 times 3 is 24, and 3 that I borrowed is 27; 27 from 4 I cannot, but 27 from 34, and there remains 7.

$$\begin{array}{r}
 (6(7 \\
 798(70 \\
 7986242 \text{ (808} \\
 983444 \\
 9838 \\
 98
 \end{array}$$

Then 1 times 0 is 0, but 3 that I borrowed is 3; 3 from 0 I cannot, but 3 from 10, and there remains 7.

Then

Then 8 times 9 is 72, and 1 that I borrowed is 73; 73 from 79, and there remains 6. So that every Souldier must have for his share 808 pounds.

6 Example.

What is the Quotient of 56037478, divided by 2306803?

Consider how often the Divisor is contained in the Dividend, which is here twice.

$$\begin{array}{r} 990141 \\ \cancel{56037478} \quad (2 \\ \underline{2306803} \end{array}$$

Then say, 2 times 3 is 6; 6 from 7, and there remains 1.

Then 2 times 0 is 0; 0 from 4, and there remains 4.

Then 2 times 8 is 16; 16 from 17 I cannot, but 16 from 17, and there remains 1.

Then 2 times 6 is 12, and 1 that I borrowed is 13; 13 from 3 I cannot, but 13 from 13, and there remains 0.

Then 2 times 0 is 0, but 1 that I borrowed is 1; 1 from 0 I cannot, but 1 from 10, and there remains 9.

D 2

Then

Then 2 times 3 is 6, and one that I borrowed is 7; 7 from 6 I cannot; but 7 from 16, and there remains 9.

Then 2 times 2 is 4, and 1 that I borrowed is 5; 5 from 5, and there remains nothing.

Remove the Divisor.

Again, Consider how many times the Divisor is contained in the Dividend, which is 4 times.

$$\begin{array}{r}
 67420 \\
 996 \overline{) 67420} \\
 \underline{5988} \\
 7532 \\
 \underline{7176} \\
 3560 \\
 \underline{3560} \\
 0
 \end{array}$$

Then say 4 times 3 is 12; 12 from 8 I cannot, but 12 from 18, and there remains 6.

Then 4 times 0 is 0, but 1 that I borrowed is 1; 1 from 1, and there remains 0.

Then 4 times 8 is 32; 32 from 4 I cannot, but 32 from 34, and there remains 2.

Then 4 times 6 is 24, and 3 that I borrowed is 27, 27 from 1 I cannot, but 27 from 31, and there remains 4.

Then

Then 4 times 0 is 0, but 3 that I borrowed is 3; 3 from 0 I cannot, but 3 from 10, and there remains 7.

Then 4 times 3 is 12, and 1 that I borrowed is 13; 13 from 9 I cannot, but 13 from 19, and there remains 6.

Then 4 times 2 is 8, and 1 that I borrowed is 9, 9 from 9 and there remains 0, so that the Quotient is 24; or the Divisor is contained in the Dividend 24 times.

Having laid down the latter part of the former Rule, in the nature of the Rule of Three, and apprehending it very necessary for young Learners, I shall therefore observe the same here in Division, which is performed by dividing the second number by the first, and the Quotient is the answer to the Question.

If 63 Gallons make 504 Pints, what 1 Gallon?

~~804~~ (8 pints.

83

If 4 Hogsheads make 252 Gallons, what 1 Hoghead?

~~252~~ (63 gall.

**

D 3

If

If 20 Tuns make 5040 Gallons, what
Tun ?

8040 (252 Gallons.
2220

If 72 C. gros allow 1080 pound for
Tare, what must 1 C. allow ?

36
1080 (15 pounds facit.
722

If 152 C. cost 760 pounds, what 1 C. :

760 (5 pounds f. cit.
152

If 500 Dollars be 28000d. what 1 Dollar ?

3
28000 (56 pence facit.
500

As in Multiplication, when the Multiplier is 10, 100, 1000, &c. you add to the Multiplicand on the right hand so many Cyphers as are in the Multiplier to make the Product, so in Division, when the Divisor is 10, 100, 1000, &c. you must cut off so many Figures from the Dividend to the right hand (with a perpendicular Line) as there are Cyphers in the Divisor, and the Figures to the left hand are the Quotient : Divide 375900 by 10, or 100, &c.

Quot. 37590 | 0, Quot. 3759 | 00

I shall not (I hope) need to trouble my self, or Learner to shew the working of this Sum, or any other, having now (as I suppose) sufficiently treated of Division, but will leave it to the censure of the most experienc'd to judg, whether this manner of dividing be not plain, lineal, and to be wrought with fewer Figures than any which is commonly taught: As for Example appeareth.

$$\begin{array}{r}
 8 \\
 97 \text{ (5} \\
 9863 \text{ (0} \\
 987529 \text{ (3} \\
 98764181 \text{ (0} \\
 9876520609 \text{ (8} \\
 987654195987 \text{ (6} \\
 49382714848765 \text{ (4} \\
 2469135786376543 \text{ (2} \\
 123456789987654321 \text{ (124999999} \\
 98765432114211111 \text{ 987654321} \\
 9876543222222222 \text{ 124999999} \\
 98765433333333 \text{ 2499999982} \\
 987654444444 \text{ 3749999974} \\
 987654555555 \text{ 4999999965} \\
 987654666666 \text{ 6249999958} \\
 987654777777 \text{ 7499999940} \\
 987777 \text{ 8749999933} \\
 988 \text{ 9999999920} \\
 9 \text{ 1124999925}
 \end{array}$$

Proof 123456789987654321. *

C H A P. VI.

R E D U C T I O N.

1. **A**S for *Reduction*, though it be no Rule absolute of it self, but merely wrought by Multiplication and Division (as I have here manifested in a plain manner) yet I think good (not altogether to omit it, lest any should censure me for so doing, in regard it is very usually practised) to deliver somewhat therefore concerning it.

Reduction teacheth one to bring all gross, or great Denominations into small, and small into great.

First, all great Denominations are brought into small by Multiplication, as

Pounds multiplied by 20, are shillings.

Shillings multiplied by 12, are pence.

Pence multiplied by 2, are half pence.

Pence multiplied by 4, are farthings.

Pounds multiplied by 240, are pence.

Pounds multiplied by 480, are half-pence.

Pounds multiplied by 960, are farthings.

Secondly,

Secondly, all small names are brought into great by Division. As,

Shillings divided by 20 are pounds.

Pence divided by 12 are shillings.

Half pence divided by 2 are pence.

Farthings divided by 4 are pence.

Pence divided by 240 are pounds.

Half-pence divided by 480 are pounds.

Farthings divided by 960 are pounds.

$$\begin{array}{r}
 1000 \\
 20 \\
 \hline
 20000s. \\
 12 \\
 \hline
 240000d. \\
 4 \\
 \hline
 960000q.
 \end{array}$$

1. Consider whether the sum propounded be to be brought into a greater or a lesser denomination.

2. Consider how many of the one can make the other, as here how many shillings can make a pound, viz. 20: and *contra*, how many shillings a pound makes, viz. 20.

D 5

There

Therefore of necessity there must be 20 times so many, which being multiplied by 20, make 20000 shillings, and by 12, 240000 pence, and by 4 *facit* 960000 farthings; as in the Example.

In 960000 farthings how many pence shillings and pounds?

$$\begin{array}{r}
 960000 \quad (240000 \quad (2000 \mid 0 \text{ s.} \\
 \hline
 444444 \quad 222222 \quad 1000 \text{ l. } \textit{facit.} \\
 \hline
 \end{array}$$

To bring shillings into pounds (or to divide by 20) cut off the first Figure towards the right hand with a dash of the Pen, and take half of the remaining Figures.

In 8471213 farthings, how many pence, groats and nobles?

$$\begin{array}{r}
 33 \text{ (1} \quad 2322 \quad (1 \\
 8471213 \quad (2227803 \quad (52945 \mid 0 \\
 \hline
 4444444 \quad 444444 \quad \textit{facit 26472 Nobles.} \\
 \hline
 \end{array}$$

Here you see the sum is to be brought into a greater Denomination than it self, which is therefore to be done by Division.

Then you are to consider what your Divisor must be, which is here 4, because 4 farthings make a peny; and as often as 4 is contained in the said sum, so many pence there are.

Your Farthings then being brought into pence, consider the next Denomination what it is, and how many of the former make one of it; as how many pence make a groat, *viz.* 4; and look how many times 4 is contained in the sum, so many groats there are.

Having brought the pence thus into groats, endeavour to bring them into nobles, by considering how many groats make a noble, *viz.* 20; therefore divide by 20 (by cutting off the first Figure towards the right hand, and taking the half of the rest) and your Quotient will be nobles.

I shall say no more as to Reduction of Money, only leave two or three Questions for the Learner to practise upon.

In 100l. how many *q. d. s.* 3*d.* and 9*d.*

In 47162 marks, how many nobles, pounds, groats, farthings, 6d. and 2d.

In 766l. 1s. 10d. how many shillings, pence and pounds, farthings, crowns, and ob.

Reduction of Cloth Measure.

II. Observe in this and all the Reduction following, how many of the one Denomination do make one of the other, and so multiply or divide according to the two Rules foregoing in Reduction of Money.

In 4372 yards, how many qrs. & Ells Fl.

$$\begin{array}{r} 4 \\ \hline 17488 \text{ qrs.} \end{array}$$

$$\begin{array}{r} \times \times \times (1 \\ 17488 \overline{) 5829} \text{ facit} \\ 3333 \end{array}$$

In 7862 Ells Eng. how many qrs. and yards?

$$\begin{array}{r} 5 \\ \hline 39310 \end{array}$$

$$\begin{array}{r} 333 (2 \\ 39310 \overline{) 9827} \\ **** \end{array}$$

In 85 pieces, each 19 Ells $\frac{3}{4}$, how many quarters, nails and yards?

Re-

Reduction of Wine Measure.

III. In 35 Tuns, how many Hogheads, gallons, pottles, quarts and pints?

$$\begin{array}{r}
 35 \\
 4 \\
 \hline
 140 \text{ hogsh.} \\
 63 \\
 \hline
 420 \\
 840 \\
 \hline
 8820 \text{ gallons.} \\
 4 \\
 \hline
 35280 \text{ quarts.} \\
 2 \\
 \hline
 70560 \text{ pints.}
 \end{array}$$

In 4712568 pints, how many gallons, and Runlets, each 11 gallons?

In 327 Barrels, each 32 gallons, how many hogheads and tuns?

Re-

Reduction of Time.

IV. In 1659 years } 365 days a year.
 how many days, hours, } 24 hours a day.
 and minutes? } 60 minutes an hour.

1659 years

365

8295

9294

4977

605535 days.

24

2422140

1211070

14532840 hours.

60

871970400 minutes.

In 87167155 minutes, how many hours,
 days and years?

In 20 years and an half, how many days,
 hours, and minutes.

Redu-

Reduction of Land Measure.

In 100 Miles, $\left\{ \begin{array}{l} 8 \text{ Furlongs a Mile.} \\ 40 \text{ Poles a Furlong.} \\ 16\frac{1}{2} \text{ Feet, a Pole.} \\ 3 \text{ Feet a Yard.} \\ 12 \text{ Inches a Foot.} \\ 3 \text{ Barley Corns an Inch.} \end{array} \right.$
 how many Fur-
 longs, Poles, Feet,
 Inches, and Barley
 Corns.

100 miles.

8

800 furlongs.

40

32000 Poles.

33

96000

96000

1056600 half feet.

528000 Feet.

12

6336000 inches.

3

19008000 barley corns.*Re*

Reduction of Troy weight.

VI. In 87 pound and $\frac{1}{2}$, how many ounces, penny weight and grains?

$$\begin{array}{r}
 87 \text{ lb } \frac{1}{2} \\
 12 \\
 \hline
 174 \\
 876 \\
 \hline
 1050 \frac{3}{4} \\
 20 \\
 \hline
 21000 \text{ dr.} \\
 24 \\
 \hline
 84000 \\
 42000 \\
 \hline
 504000 \text{ grains.}
 \end{array}$$

In 7151213 grains, how many penny weight, ounces and pounds?

In 15 Ingots, each 7 pound and $\frac{1}{2}$, how many ounces, penny weight and grains?

Re:

*Reduction of Averdupois Weight.*VII. In 96 C. weight, how many *qrs.* *lb.*(and $\frac{3}{4}$?

$$\begin{array}{r}
 \underline{4} \\
 384 \text{ quarters.} \\
 \underline{28} \\
 3072 \\
 \underline{768}
 \end{array}$$

10752 *pounds.*

$$\begin{array}{r}
 \underline{16} \\
 64512 \\
 \underline{10752}
 \end{array}$$

172032 *ounces.*In 40 C. $\frac{1}{2}$ 19 pounds 11 ounces, how ma-(ny *qrs.* *lb.* and $\frac{3}{4}$?

$$\begin{array}{r}
 \underline{4} \\
 162 \text{ quarters.} \\
 \underline{28}
 \end{array}$$

1305

325

4555 *pounds.*

16

27731

4556

72891 *ounces.*In 8714 ounces, how many *pounds*, *qrs.*
and C?

In

In 20 Bags, each 3 C. $\frac{1}{2}$, how many qrs. and Pounds?

4

14

28

112

28

392 pounds in one.

20

7840 pounds in all.

Where you find the word [each] have a special regard to it, and reduce the particulars which it implieth, first into one Denomination, then when you know how much is contained in one, you may easily know how much is in all.

In 36 Barrels of Figs, each 3 C. $\frac{1}{4}$ gross, Tare 19 pound per Barrel, how many pounds neat?

Whether the word [Tare] imply per Bag, per Barrel, or per C. &c. it is all as one, if you keep to your former Rule in Multiplication, by observing which, you cannot miss of, what you would know; as here Tare 19 pounds per Barrel?

Say, if 1 Barrel give 19 pounds, what 36 Barrels?

Mul.

Multiply 19 and 36 together, and the Product is pounds Tare; then subtract the pounds Tare from the pounds Gross, and the remains are pounds Neat.

$ \begin{array}{r} 36 \text{ Barrels} \\ 19 \text{ Tare for 1 Barrel.} \\ \hline 324 \\ 36 \\ \hline 684 \text{ Tare in all.} \\ \hline \end{array} $	$ \begin{array}{r} 3 \text{ C. } \frac{1}{4} \\ 4 \\ \hline 12 \\ 28 \\ \hline 104 \\ 26 \\ \hline 364 \text{ pounds in one} \\ 36 \text{ (Barrel.)} \\ \hline 2184 \\ 1092 \\ \hline 13104 \text{ pound Gross.} \\ 684 \\ \hline 12420 \text{ pound neat.} \\ \hline \end{array} $
--	--

In 45 Bags of, &c. each 17 C. $\frac{1}{2}$ gross,
Tare 15 pounds per Bag, how many C. neat?

In 47 C. $\frac{1}{2}$ gross, Tare 17 pounds per. C.
how many pounds neat?

In

In 5 Hogheads of Tobacco, each containing as followeth, how many C. neat?
viz.

		C. qrs.	lb.		lb.
Number	1	4	2	11	63
	2	3	1	12	72
	3	2	3	16	56
	4	4	1	23	75
	5	3	2	27	64
				tare	

In 57120 C. $\frac{1}{2}$ of Lead, how many Fother at 19 C. $\frac{1}{2}$?

In 5671 Pigs of Lead, each 7. $\frac{1}{2}$ how many Fother at 19 C. $\frac{1}{2}$?

facit 2181 Fother $\frac{21}{2}$.

CHAP. VII.

Numeration of Fractions.

THE next thing to be treated of, are Fractions.

1. Concerning which, I shall shew what a Fraction is.

2. How it is exprest.

3. How many sort of Fractions there are.

A

A Fraction, or broken Number, is a part or many parts of a whole Number: For as whole Numbers take their beginning from one, and continue in number without end; so the said whole Numbers by imagination, may be dissolved or broken into pieces or parts infinite.

Therefore to attain the knowledge of them, acquaint your self with these two terms, Numerator and Denominator.

The Numerator expresseth the number of the parts.

The Denominator giveth those parts their names.

$$\begin{array}{rcl} 1 & 2 & 3 \\ \hline 2 & 3 & 4 \end{array} \begin{array}{l} \text{Numerator.} \\ \text{Denominator.} \end{array}$$

Proper Fractions. $\left\{ \begin{array}{l} 1 \\ 2 \\ 3 \\ 4 \end{array} \right.$ is the one half of any thing.
is two third parts of any thing.
is three quarters of any thing.
is four five parts of any thing.

Fractions of Fractions.

Fractions of Fractions have commonly this word (of) between them, as $\frac{2}{3}$ of $\frac{3}{4}$, that is, two thirds of three quarters.

If

Improper Fractions.

If the *Numerator* be greater than the *Denominator*, the Fraction is improper, and containeth a *Unite* or *Unites*, or some part or parts of the *Denominator*, as $1\frac{3}{4}$ is 3 Integers, or whole, and 3 quarters; but when the *Numerator* and the *Denominator* are alike, they make a *Unite*.

Though *Addition* in whole *Numbers* be immediately after *Numeration*, yet in *Fractions* it is not so, because there are, as here you see, *Fractions* of several sorts, which must of necessity be reduced into one *Denomination*, before they can be added. Therefore to avoid disorder I shall first shew what this *Reduction of Fractions* is; secondly how to reduce all *Fractions* to one *Denomination* or likeness.

C H A P. VIII.

Reduction of Fractions.

What *Reduction* is.

Reduction teacheth to bring *Integers* into *Fractions*, or contrary; yea *Fractions* of divers *Denominations* into one, or what you list.

I would have reduced $\frac{1}{2} \frac{2}{3} \frac{3}{4}$ of an Ell; or what you please into one Denomination.

To Reduce proper Fractions.

For the effecting of this, and all other of this kind, multiply all the Denominators together (which product take for a common Denominator) as 2 times 3 is 6, and 4 times 6 is 24, your Denominator.

Then multiply the Numerator of the first in all the other Denominators, except its own Denominator; as once 3 is 3, 3 times 4 is 12, which take for a new Numerator to the first Fraction.

Then multiply the second Numerator in all the Denominators, except its own; as 2 times 2 is 4, and 4 times 4 is 16, which likewise take for a new Numerator to the Second.

Then Multiply the third Numerator in all the Denominators, except its own; as 3 times 3 is 9, 2 times 9 is 18, which also place for a new Numerator to the third, and your work standeth thus:

$$\begin{array}{r}
 12 \quad 16 \quad 18 \quad \text{So that } \frac{12}{24}, \frac{16}{24}, \frac{18}{24}, \\
 \hline
 \frac{1}{2} \quad \frac{2}{3} \quad \frac{3}{4} \text{ are equal to } \frac{1}{2}, \frac{2}{3}, \frac{3}{4} \\
 24
 \end{array}$$

II. To reduce Fractions of Fractions into one Denomination.

Multiply all the Numerators together, and take the Product thereof for a new Numerator, and likewise multiply all the Denominators together, and make the Total a Denominator.

$$\begin{array}{r} 6 \\ \text{Example. } \frac{1}{2} \text{ of } \frac{2}{3} \text{ of } \frac{2}{4} \\ \hline 24 \end{array}$$

III. To reduce improper Fractions into whole Numbers.

Divide the Numerator by the Denominator.

$$\begin{array}{r} \text{Example.} \quad \frac{23}{4} \quad \begin{array}{l} 3 \\ 23 \overline{) 53} \\ 4 \end{array} \end{array}$$

IV. To reduce a whole Number into an improper Fraction.

Let the Number given be the Numerator, and 1 the Denominator.

Example. Reduce 13 Integers into an improper Fraction. *facit* $13\frac{1}{1}$

V. To

V. *To reduce a whole Number joyned with a Fraction into one Denomination.*

Multiply the whole Number into the Denominator of the Fraction, adding thereto the Numerator.

Example. 5 yards and $\frac{3}{4}$ facit $2\frac{3}{4}$.

VI. *To reduce a great Fraction into lesser terms equivaluable to it self.*

Take the half of the Numerator, and half of the Denominator, as oft as you can, and when you can take the half no further, take the one third, or the one fourth, or the one fifth, &c. both of the Numerator and Denominator.

Example.

I would abbreviate $\frac{42}{120} | \frac{12}{60} | \frac{6}{30} | \frac{3}{15} | \frac{1}{5}$

Take the half 24, which is 12, then the half of 120, which is 60; again the half of 12, which is 6, and the half of 60 is 30, then the half of 6 is 3, and the half of 30 is 15; here you see that the half cannot be taken both of the Numerator and Denominator, therefore try whether it will be abbreviated by 3, as thus: How
E many

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many times 3 in 3, once, then how many times 3 in 15, five times. So that $\frac{1}{5}$ is in the lowest Denomination, yet it retains the same value; for $\frac{1}{5}$ is equal to $\frac{24}{120}$.

A second kind of Abbreviation.

Though by the former Rule all Fractions might be abbreviated, yet when you cannot take $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{7}, \frac{1}{8},$ or $\frac{1}{9}.$ &c. They seem more tedious than by this second way, as may appear.

I would have this Sum abbreviated, $\frac{3077}{416}$ into a lesser Fraction.

For the reducing whereof, divide the Denominator by the Numerator, and the remain of the Division will be 1086, by which divide the former Divisor, 3077, and there will remain 905, by which divide your last Divisor 1086, and there will remain 181, by which remains likewise divide the Divisor 905, and there will remain c.

Where note, that having divided your Denominator by the Numerator, and the Divisor of every Division so often by the Remains, that nothing will remain; Then that last Divisor will divide both your Numerator and Denominator of your Fraction

As

As in the Example.

$\frac{1011}{4163}$ *facit*, $\frac{17}{23}$ equal to the former.

How to reduce or alter any Fraction to another Denomination, as Money, Weight, or Measure, &c.

Multiply the Numerator by such a new Denominator or Number which you intend, dividing the Product by the former Fractions Denominator, whose Quotient shall be a Numerator to the Denominator last chosen.

Example.

What is $\frac{2}{3}$ of 12d.

2×4 (8d.
3

What is $\frac{5}{9}$ of 20 Shillings?

What is $\frac{7}{8}$ of a Flem. Ell?

What is $\frac{2}{7}$ of a Yard?

What is $\frac{3}{8}$ of a Tun of Wine?

What is $\frac{6}{7}$ part of a Tun of Iron?

What is the $\frac{2}{10}$ part of a Hoghead of Sack?

What $\frac{4}{5}$ of a Dollar at 4s. 8d.

facit +4d. $\frac{4}{5}$.

6

What is $\frac{1}{2}$ of $\frac{2}{3}$ or $\frac{1}{4}$ of 5 shillings?

24

E 2

R

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Reduce Fractions of Fractions to one single Fraction, and work as before.

$$\frac{25}{24} \frac{13}{12} \frac{1}{4} \text{ of } \frac{1}{7} (1 \text{ s. } \& \frac{1}{4}.$$

What is $\frac{4}{5}$ of a Dollar at 4 s. 8 d?
facit 44 d. $\frac{4}{5}$.

C H A P. IX.

Addition of Fractions.

I. **A**DDITION of Fractions is the putting of two or more broken Numbers into one sum, or principal Fraction.

In this Rule and the next, observe, that all Fractions whatever, proper or improper, must be of one Denomination, or reduced thereto by the former Rules.

2. Being of one Denomination only, add all the Numerators together, which Total subscribe for a new Numerator over the common Denominator.

Example.

Add $\frac{2}{3}$ and $\frac{3}{5}$ of any thing together.
 $\frac{2}{3}$ and $\frac{3}{5}$ *facit* $\frac{17}{15}$, or one whole one.

$$\begin{array}{r}
 326 \\
 \hline
 (\begin{array}{|c|c|c|} \hline 3 & 1 & 96 \\ \hline \end{array}) \\
 \hline
 \frac{1}{2} \frac{2}{3} \frac{3}{4} \frac{4}{5} \text{ together facit } \frac{326}{120}
 \end{array}$$

Reduce them into one Denomination by the first Rule of Reduction, then add the Numerators, as in the last example.

A more speedy way.

Multiply all the Denominators that differ in quantity each from other, and the Total thereof shall be the common Denominator, and Dividend to each particular Denominator, whose *Quotient* multiply into its Numerator, and set it directly against its own Fraction; and, *in fine*, add them all up, which Total shall be a new Numerator unto the common Denominator; and add as many Integers as they make to the whole Numbers.

Example.

It

(24 or 12

$$\begin{array}{r|l}
 620\frac{1}{4} & 3 \\
 271\frac{1}{3} & 4 \\
 103\frac{1}{2} & 6 \\
 017\frac{3}{4} & 9 \\
 716\frac{1}{2} & 6 \\
 \hline
 1723\frac{1}{3} & \frac{28}{12}
 \end{array}$$

28 (2

12

III.

E 3

III. Yet a more short way.

Cast your Eye upon the Denominators, and imagine what number will be divided by them all, and that shall be your common Denominator and Dividend unto each particular Denominator; then work as before in the last Examples. (11)

Number 12 will be
divided by all the
Denominators.

$$\begin{array}{r} 472 - \frac{3}{12} 6 \\ 315 - \frac{4}{12} 9 \\ 917 - \frac{1}{12} 6 \\ 106 - \frac{11}{12} 8 \\ 317 - \frac{1}{6} 2 \\ 125 - \frac{1}{4} 3 \end{array}$$

$$2308 - \frac{5}{6} \frac{34}{12} \quad 10$$

$$\begin{array}{r} 34 \frac{1}{2} \\ 32 \end{array}$$

IV. Addition of Fractions of Fractions.

Reduce your Fractions into a single Fraction, according to the second Rule in Reduction, then work as before.

Exam. Add $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ unto $\frac{4}{5}$ of $\frac{6}{7}$

$$\begin{array}{r} 6 \quad | \quad 24 \quad | \quad 210576. \\ \hline \frac{1}{2} \text{ of } \frac{2}{3} \text{ of } \frac{3}{4} \text{ unto } \frac{4}{5} \text{ of } \frac{6}{7}: \quad \frac{6}{41} \quad \frac{24}{35} : \quad \frac{210}{786} \\ \hline 24 \quad | \quad 35 \quad | \quad 840 \text{ fa. } \frac{786}{840} \end{array}$$

V. Ad.

V. *Addition of improper Fractions.*

Reduce your Fractions into one Denomination, and work *ut supra*.

Example.

Add $\frac{3}{4}$ and $\frac{7}{8}$

$$\begin{array}{r}
 58 \\
 \hline
 30 \qquad 28 \\
 \frac{2}{4} \qquad \frac{7}{8} \text{ facit } \frac{31}{8} \\
 \hline
 24
 \end{array}$$

VI. *To add a single Fraction unto a Fraction of Fractions.*

Example: Add $\frac{3}{4}$ and $\frac{1}{3}$ of $\frac{4}{5}$ together; of $\frac{4}{5}$ reduce into a single Fraction, according to the second Section in page 72, and work as before.

$$\begin{array}{r}
 61 \\
 \hline
 4 \qquad 16 \qquad 45 \\
 \frac{1}{3} \text{ of } \frac{4}{5} \qquad \frac{4}{15} \text{ and } \frac{3}{4} \text{ facit } \frac{61}{60} \\
 15 \\
 \hline
 60
 \end{array}$$

CHAP. X.

Subtraction of Fractions.

SUBTRACTION is the taking of one Fraction from another, a less from

a greater, or an equal from an equal.

1. Because Subtraction teacheth to take a lesser Fraction from a greater, it will not be amiss to shew you how to know the one from the other

2. Those Fractions are accounted the greatest, whose Numerator multiplyed by the Denominator of the other Fraction, maketh the greatest number.

And as in Addition, so here, all Fractions to be subtracted, must be of one Denomination, or reduced thereunto.

II. *To Subtract Fractions of the Denomination.*

Subtract one Numerator from the other, and set the Remain over the common Denominator.

Example.

Subtract $\frac{2}{3}$ from $\frac{3}{3}$ remain $\frac{1}{3}$.

III. *To Subtract a whole Number and a Fraction, from a whole Number and a Fraction.*

First, reduce your Fractions into one Denomination, then Subtract the one Numerator from the other: and from the Integer subtract as you were taught in whole Numbers.

Example.

Receive 30 l. $\frac{3}{4}$. Laid out 10 l. $\frac{1}{2}$.

$$\begin{array}{r}
 2 \\
 \hline
 6 \quad 4 \\
 \frac{3}{4} \quad \frac{1}{2} \text{ Remain } \frac{2}{8} \text{ or } \frac{1}{4} \\
 \hline
 8
 \end{array}$$

IV. *Another way.*

Multiply the Denominators together, and let the Product be the common Denominator, which common Denominator divide by each particular Denominator, and multiply the Quotients by their Numerators, and set down their Products directly against its Fraction, and then subtract, as if it were in whole Numbers.

As for Example.

Received 100 $l.$ $\frac{2}{3}$ 25

Spent 93 $l.$ $\frac{3}{5}$ 18

Remains 7: $\frac{1}{30}$

V. *When the Fraction to be Subtracted, is greater than the Fraction you are to Subtract from,*

Reduce them into one common Denominator (as you did in the last Example), and subtract the greatest Numerator from the common Denominator, and add the Remains to the Numerator of the less

E 5

which

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which subscribe for a new Numerator unto the common Denominator, then carry one to the next integer, and subtract as in whole numbers.

	<i>l.</i>	<i>s.</i>		<i>C.</i>
Received	—	5—0	Bought	16 $\frac{1}{4}$ 7
Paid	—	3— $\frac{2}{3}$	Sold	14 $\frac{3}{7}$ 12
Remains	—	1— $\frac{3}{5}$	Remains	1 $\frac{23}{28}$

VI. When Fractions of Fractions are to be subtracted, they must be reduced into single Fractions, then subtracted as before. *Example*, $\frac{1}{2}$ of $\frac{2}{3}$ to be subtracted from $\frac{4}{5}$ of $\frac{4}{5}$, being reduced into single Fractions, they are $\frac{1}{3}$ and $\frac{4}{5}$.

$$\begin{array}{r}
 4 \\
 \hline
 5 \frac{1}{3} \quad 9 \frac{2}{3} \text{ Remain } \frac{4}{15} \\
 \hline
 15
 \end{array}$$

CHAP. XI.

Multiplication of Fractions.

IN Multiplication of Fractions, whether they be proper, improper, mixt, or compound, they must likewise be reduced to single Fractions; multiply the Numerators therefore together, and the product shall be a new Numerator: then multiply all the Denominators, and the Product thereof shall be the Denominator. *Ex.*

Ch. XI. *Multiplication of Fractions.* 83

Example.

Multiply $\frac{2}{3}$ by $\frac{3}{4}$ | $\frac{2}{3} \times \frac{3}{4}$ facit $\frac{6}{12}$ or $\frac{1}{2}$

It might seem (somewhat) strange to young Learners, that $\frac{2}{3}$ of a pound being multiplied by $\frac{3}{4}$ of a pound, should make but $\frac{1}{2}$: Therefore to inform them, I think meet to acquaint them, that as whole Numbers multiplied by whole Numbers, do increase the Product, so proper Fractions multiplied by proper Fractions, do diminish the Product: For as 1 multiplied by 1, makes but 1; so that which is less than 1, being multiplied by that which is less than 1, must needs make less than either of them. Or thus: $\frac{2}{3}$

$$\begin{array}{r} \frac{2}{3} \\ \times \frac{3}{4} \\ \hline \frac{6}{12} \end{array}$$

To Multiply Fractions of Fractions.

II. Reduce them into single Fractions, then work as before.

Example. $\frac{3}{4}$ of $\frac{2}{3}$ by $\frac{1}{2}$ of $\frac{2}{3}$ being reduced they are $\frac{1}{2}$ and $\frac{1}{3}$, and being multiplied, facit $\frac{1}{6}$

To multiply a whole Number and a Fraction together.

III. Multiply the Numerator by the whole

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whole Number, and divide the Product by
the Denominator.

Example.

Multiply 4 by $\frac{3}{4}$. *xx (3 facit.*

4

To multiply a whole Number and a Fraction by a whole Number.

IV. Reduce the whole number and Fraction into an improper Fraction, then work as before.

Example. 2 and $\frac{2}{3}$ by 4 facit $\frac{32}{3}$ or $10\frac{2}{3}$

To Multiply a whole Number and a Fraction by a whole Number and a Fraction.

Reduce each of them into an improper Fraction, and work as before in Sect. I.

Example.

Multiply 3 and $\frac{1}{4}$ by 2 and $\frac{1}{3}$
 $\frac{13}{4}$ by $\frac{7}{3}$ facit $\frac{91}{12}$ or $7\frac{7}{12}$

C H A P. XII.

Division of Fractions.

AS in Multiplication, so in this, all Fractions that are to be divided, must be reduced to single Fractions, both for the Dividend or Divisor: Then set that Fraction which is the Dividend on the left

left hand, and that for Divisor on the right hand; then multiply Cross-wise the Numerator of the Dividend by the Denominator of the Divisor, and subscribe the Product for a new Numerator: Likewise multiply the Denominator of the Dividend by the Divisors Numerator, and the Product shall be a new Denominator.

Example.

What is the Quotient of $\frac{4}{3}$ divided by $\frac{3}{4}$

Place your Fractions

thus, with this X Character between them, and

work according to the directions before given.

$$\begin{array}{r} 4 \times 3 \\ 3 \times 4 \\ \hline 16 \\ 12 \end{array}$$

facit $\frac{16}{12}$ or 1 whole (one, and $\frac{1}{3}$)

I demand the Quotient of $\frac{4}{3}$ divided by $\frac{3}{4}$?

$$\begin{array}{r} 4 \times 3 \\ 3 \times 4 \\ \hline \end{array}$$

facit $\frac{8}{9}$.

In Division of the whole Numbers, the Dividend must be always greater than the Divisor, otherwise you can make no Quotient. But in division of Fractions it is otherwise, as in the second Question propounded, $\frac{2}{3}$ to be divided by $\frac{3}{4}$: for $\frac{3}{4}$ is greater or more than $\frac{2}{3}$ yet it may be divided: for as the Multiplication of proper Fractions (as was said before) doth diminish the Product, so Division of proper Fractions doth increase the Quotient.

II. To

II. To divide a whole Number by a Fraction.

I demand the Quotient of 20 divided by $\frac{1}{2}$?

20 Being the whole Number, convert it into an improper Fraction by placing an **U**nite for a Denominator, and it standeth thus:

$$\begin{array}{r} \frac{1}{2} \times \frac{20}{1} \\ \hline \text{facit } \frac{40}{1} \end{array}$$

III. To divide a whole Number and a Fraction, by a whole Number and Fraction.

I demand the Quotient of 5 and $\frac{1}{2}$ divided by $3\frac{1}{4}$?

$$\begin{array}{r} \frac{13}{4} \times \frac{11}{2} \\ \hline \text{facit } \frac{44}{2} \end{array}$$

IV. To divide Fractions of Fractions.

I demand the Quotient of $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ divided by $\frac{2}{3}$ of $\frac{1}{2}$?

Reduce the Dividend into one single Fraction, and likewise the Divisor, then work as before.

$$\begin{array}{r} \frac{2}{3} \times \frac{6}{21} \\ \hline \text{facit } \frac{6}{48} \end{array}$$

CHAP.

C H A P. XIII.

The Rule of Three.

I. **T**HE *Rule of Three* is commonly called, *The Golden Rule*; and indeed it might be so termed, for as Gold transcends all other Metals, so doth this Rule all others in Arithmetick.

II. Now, for your better information concerning it, you must observe, that there are three Numbers known, by which a fourth that is unknown may be found out, which bear like proportion to the third, as the second doth the first.

III. Here also is to be noted, that if your Sums consist of sundry Denominations, then the first and third numbers must be of the same Denomination, as also the fourth and the second: As thus, if the first number be Yards, the third likewise must be Yards; if the second be Pence, then the fourth must be Pence.

IV. But the greatest difficulty lyeth in the stating the Question.

There

Therefore observe first, That what you desire to know, or to be resolved in the question, must be your third Number; and you have commonly these words before it: as. *What cost? How long? How broad? How much? How deep, &c.*

2. Your Question being stated, bring first and third Numbers into one Denomination.

3. Bring your second into the least name mentioned, or as low as you desire the Question to be answered in.

4. Observe whether your third Number requires more or less; if more, then multiply the middle number by the greater of the two extreams, and divide by the lesser, and the Quotient answereth the Question.

But if it require less, then multiply the middle number by the lesser of the two extreams, and divide by the greater.

These two words *more* or *less*, being well observed, the Scholar will understand what he doth, and need not to make two distinct Rules of Three, as most do.

The four first Questions are stated four several ways, by which the one is a proof of the other.

And

And thus you may easily work all the rest, which will be advantagious to the Scholar, and likewise an ease to the Master ; I shall therefore only give you the *facits* of the following Questions.

If 6 yards cost 10s. what 1 : yards?

$$\begin{array}{r} 10 \\ \hline 120 \\ \times 20 \text{ (20 shillings)} \\ \hline 200 \end{array}$$

If 12 yards—20 s.—6 yards?

$$\begin{array}{r} 20 \\ \hline 120 \\ \times 20 \text{ (10s)} \\ \hline 240 \end{array}$$

20 s.—by 12 yards, what will 10s?

$$\begin{array}{r} 12 \\ \hline 120 \\ \times 20 \text{ (6 yards)} \\ \hline 240 \end{array}$$

If 10s.—6 yards—20s?

$$\begin{array}{r} 6 \\ \hline 120 \\ \times 20 \text{ 12 yards} \\ \hline 240 \end{array}$$

If six Men will be a finishing a piece of Work ten days, how long time will 12 Men be a doing the same ?

<i>men.</i>	<i>days</i>	<i>men.</i>
6	10	12
10		
<hr style="width: 50%; margin: 0 auto;"/>		
60		<i>8d (5 days.</i>
		<i>22</i>

If 12 men — 5 days — 6 men?

5	
<hr style="width: 50%; margin: 0 auto;"/>	
60	<i>8d (10 days.</i>
	<i>88</i>

If 5 days — 12 men — 10 days?

12	
<hr style="width: 50%; margin: 0 auto;"/>	
60	<i>8d (6 men.</i>
	<i>22</i>

If 10 days — 6 men — 5 days?

6	
<hr style="width: 50%; margin: 0 auto;"/>	
60	<i>8d (12 men.</i>
	<i>22</i>

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If 2 lb. cost $9d. \frac{3}{4}$, what cost 2 C. $\frac{1}{2}$?

$$\begin{array}{r} 4 \\ \hline 39 \text{ qrs.} \end{array} \qquad \begin{array}{r} 4 \\ \hline 10 \\ 28 \\ \hline \end{array}$$

$$\begin{array}{r} \cancel{2880} \text{ (5460 qrs.} \\ \cancel{2220} \qquad \qquad \qquad 80 \\ \qquad \qquad \qquad 20 \\ \hline 280 \text{ lb.} \\ \hline 39 \\ \hline 2520 \\ 840 \\ \hline 10920 \end{array}$$

$$\begin{array}{r} \text{If } 280 \text{ lb.} \text{---} 5460 \text{---} 2 \text{ lb.} \\ \qquad \qquad \qquad 2 \\ \hline \hline 10920 \end{array}$$

$$\begin{array}{r} \cancel{288} \\ \cancel{2880} \text{ (32 qrs. facit.} \\ \cancel{2880} \end{array}$$

$$\begin{array}{r} \text{If } 5460 \text{ qrs.} \text{---} 280 \text{ lb.} \text{---} 39 \text{ qrs.} \\ \qquad \qquad \qquad 280 \end{array}$$

$$\begin{array}{r} \cancel{2880} \text{ (2 lb facit.} \\ \cancel{5460} \qquad \qquad \qquad 3120 \\ \qquad \qquad \qquad 78 \\ \hline 10920 \end{array}$$

If

If 39 qrs.—2 lb.—5460 qrs.

2

31 10920
 32920 (280 lb. facit.
 3999
 33

If I spend 475 lb 11 s. 10 d. a year, I
 demand how much that is one day with
 another?

days. l. s. d. day.

If 365—476—11—10—1

20

9531

12

19062

9532

114382

(1

22 (3

483 (7

214382 (313 d.

36555

366

3

If

If 1 day — 313 d. — 365 d.

313

1095

3657

10953

1

114382 d.

If 313 d. — 1 d. — 114382 d.

(1

11 (3

2040

114382 (365 days.

31333

311

3

days.

If 114382 d. — 365 — 313

365

1565

18787

9393

1

114382

114382 (1 d.

114382

Ac

At 15d. $\frac{1}{4}$ per lb. how many C. weight for 11l. 11s. 11d?

facit 1 C. $\frac{1}{2}$ lb $\frac{3}{4}$

If 9 Ells $\frac{1}{5}$ cost 27s. 5d. what cost 80 pieces, each 25 yards and $\frac{1}{4}$, and 12 pieces, each 19 Ells $\frac{3}{4}$?

facit 275l. 16s. 8d. $\frac{12}{33}$

If 100lb. of Cloves cost 88l. 11s. 10d. and 1 C. weight of Mace 99l. 10s. 3d. what cost 3 $\frac{3}{4}$ one with another?

facit 3s. 3d. $\frac{2147}{3398}$

If 1 pair of Stockins cost 10 groats, how many dozen pair shall I have for 100 Marks?

facit 33 dozen pair $\frac{1}{3}$

If 7 lb $\frac{1}{2}$ of Currants cost 2s. 7d. what cost 3 Butts, each 15 C. $\frac{1}{2}$, 14 lb gross, tare 39 lb. per Butt?

facit 88l. 8s. 0d. $\frac{3}{3}$

If 5 Ells $\frac{3}{5}$ of Cambrick cost 21s. 8d. what cost 120 pieces, viz.

	Ells.	qrs.	na.
Number. {	A.	30 qt.	272—2—1
	B.	50 qt.	401—3—1
	C.	40 qt.	341—1—3
			<hr/>
			1015—2—1

facit 196l. 8s. 9d. 3qrs. $\frac{4}{7}$

Sold 5 Bags of Pepper, each, viz. tare 43
 lb per Bag, and net 4 lb per 104 lb. at 1 *sd.*
 $\frac{4}{5}$ per lb neat; what comes it to neat?

Also I demand how many Dollars of 4s.
Sd. a piece will pay for the neat weight?

	C.	grs.
Number	G qt. 3	2
	H qt. 4	1
	L qt. 5	3
	M qt. 2	1
	O qt. 3	3
<i>facit</i> 515 Doll.		$\frac{174}{224}$ or $\frac{187}{112}$
	19	2

Sold 10 Packs of Cloath, each Pack qt.
 10 Cloths, and each Cloth 39 yards, at
 11s. 11d. per yard: I demand how much
 it comes to in all? *facit* 2323l. 15s. 0d.

C. grs. lb.
 Bought of several persons 433—3—17
 of Currants at 4d. per lb. to whom I have
 sold 512 C. 3 grs. 7lb. of Sugar at 2d. $\frac{3}{4}$
 per lb. Now I would know what remains
 for me to pay, they having taken the Sugar
 in part of payment.

809l. 19s. 00
 667l. 01s. 10 $\frac{1}{4}$

facit Rem. to pay 142l. 17s. 01 $\frac{3}{4}$
 A

A Merchant died, being indebted to several Creditors (*viz.*) to A. 40*l.* to B. 56*l.* to C. 80*l.* Now he being dead, his Estate was worth but 30*l.* I demand what each man must have?

$$\begin{array}{r} \text{A. } 6\frac{144}{176} \\ \text{B. } 9\frac{96}{176} \\ \text{C. } 13\frac{112}{176} \end{array}$$

facit 30*l.*

Bought 100 pieces of Cloth for 411*l.* 11*s.* 11*d.* what containeth the Cloth, the yard being valued at 7*s.* 8*d.*

facit 1073 yards $\frac{67}{92}$

If 1 pound of *Virginia* Tobacco cost 10*d.* $\frac{1}{2}$, what cost 3 Hogsheads, weight 17 C $\frac{1}{2}$ 12*lb.* gross, tare 37*lb.* per Hogshead, and 4*lb.* per 104*lb.* tret.

facit 78*l.* 6*s.* 3*d.*

Also I demand how many Duckets of 3*s.* 9*d.* $\frac{1}{4}$ will pay for the neat weight?

facit 413 Duckets $\frac{65}{181}$

A Merchant hath owing 357 *l.* 9*s.* and his Debtor doth agree with him to pay him for every pound 13*s.* 5*d.* I demand what must he pay?

facit 239 *l.* 15*s.* 9*d.* $\frac{3}{4}$.

A Man died, having three Sons and two Daughters, he gave to the eldest Son 2000 *l.* to the second 1900 *l.* to the third 1500 *l.* to the Eldest Daughter 700 *l.* to the second 500 *l.* Now, he being dead, his Estate was worth but 2020 *l.* I demand what each Child must have?

Eldest Son	—————	662	$\frac{18}{61}$
Second Son	—————	629	$\frac{11}{62}$
Third Son	—————	331	$\frac{9}{61}$
Eldest Daughter	—————	231	$\frac{49}{61}$
Second Daughter	—————	165	$\frac{35}{61}$

facit 2020

If I buy a piece of Cloth for 84 *l.* 11*s.* and I sell the Ell *Eng.* for 7*s.* 8*d.* I demand how many yards were contained in the said piece?

facit 275 yards $\frac{1}{2}$ & $\frac{13}{16}$ of a qr.

£

Sold

A

Sold 4 parcels of Sugar, containing as following :

	C.	qrs.	lb.	
The first containing	86	—2—	21	tare 84
The second containing	76	—1—	12	tare 56
The third containing	98	—3—	11	tare 92
The fourth containing	75	—1—	17	tare 85

At 35 s. per C. neat, facit 585 l. 6 s. $\frac{28}{112}$ or 3 d.

If 50 C. 3 qrs. 15 lb. of Sugar cost 21 l. 19 s. 11 d. how many Chests of 86 C. $\frac{1}{2}$ shall I have for 1000 Marks and 486 l.

facit 30 Chests and $\frac{8009}{9698}$ of a Chest.

If 5 penny weight of Silver cost 7 d. $\frac{1}{2}$, what cost 3 Ingots, each 11 lb. $\frac{1}{2}$?

facit 50 l. 0 s. 6 d.

If a Gent. hath 960 l. 12 s. per annum, how much may he spend one day with another, to lay up 100 Marks at the years end to purchase withal?

facit 146 groats $\frac{346}{365}$ per diem.

A Merchant bought 376 Cloaths, at 11 l. 11 s. 1 d. per Cloath, which he ship'd for Spain, to have returns from thence, the one half in Wine, at 28 l. per Tun, and the other half in Sugar, at 27 s. per

per C. weight, I demand how much of each must be returned for the said Cloaths?

77 Tuns $\frac{271}{1880}$ of Wine:
1609 C. 2 $\frac{62}{82}$ of Sugar.

There are 101 Pipes of Oyl, that contain 12307 Gallons, I would know how much 59 Pipes and $\frac{1}{2}$ will contain, and what it will amount to at 36*l.* *per* Tun, the Tun being 236 Gallons.

facit 1105*l.* 18*s.* 7*d.* $\frac{172}{236}$.

A Merchant bought 9870 C. $\frac{1}{2}$ of Lead, which cost 7*l.* 8*s.* 5*d.* *per* Fother, (or 19 C. $\frac{1}{2}$) the charges upon the same amounts to 125*l.* 12*s.* which he ventures for *France*, to receive from thence *French* Wine at 13*l.* 10*s.* *per* Hogshead: I demand how many Hogsheads he must receive for content?

facit 287 Hogsheads $\frac{1762}{236}$.

A Grocer delivered 7657 $\frac{1}{2}$ of Tobacco in the Roll to be cut and dried, and when it came home, it held out but 5639 $\frac{1}{2}$. I demand what is lost in the pound, and also supposing it cost in the Roll 8*d.* $\frac{1}{3}$ *per* $\frac{1}{2}$ and the cutting

$1\text{ d. } \frac{1}{4}$ per pound, I demand what it now stands him in?

$$\begin{array}{r}
 1\text{ l.} \text{-----} 2\text{ d. } \frac{3}{4} \text{-----} 7657\text{ l.} \\
 \text{It stands him in } 311\text{ l. } 1\text{ s. } 3\text{ d. } \frac{3}{4} \\
 7657\text{ l.} \text{-----} 1818\text{ l.} \text{-----} 1\text{ l.} \\
 \text{facit } 33\frac{6217}{5557} \text{ lost per pound.}
 \end{array}$$

CHAP. XIV.

The Rule of Three in Fractions.

AS in the Rule of Three in whole Numbers, I laid down certain Principles both for the better discovering, and more easie work thereof: so in this of Fractions, I shall endeavour to make all things as plain and familiar as may be.

And first, because many questions seem very ambiguous, whether they belong to the Rule of Three direct, or indirect.

That you may be rightly informed concerning them, cast your Eye upon the third Number in the question, and see whether it be greater or less than the first Number.

But if you cannot easily apprehend which is the greater or lesser, then work according to the second Section in *pag. 80.*

What

What
questions
belong to
the Rule
of Three
direct.

If the third number be greater than the first, and the Answer required be greater than the second, it is upon the Rule of Three direct.

And likewise if the third number be less than the first, and the Answer required be less than the second, it belongs to the same Rule.

What
questions
belong to
the Rule
of Three
indirect.

But if the third Number be less than the first, and the Answer required be greater than the second, it is pertaining to the indirect Rule.

And if the third Number be greater than the first, and the Answer required less than the second, it is according to the same Rule.

Having thus found out to what Rule it belongs, first consider diligently, viz. whether the first and third Numbers be both of one Denomination, if not, they must be reduced into the least of these Denominations.

2. That your second being a compound Fraction, must be reduced into the lowest or least name mentioned.

The operation of the Rule of Three direct.

Multiply the Denominator of the first Fraction into the Numerator of the second and third, and the total thereof shall be the Dividend.

Multiply also the Numerator of the first number by the Denominator of the second, and that Product by the Denominator of the third, and the Total shall be the Divisor.

The operation of the Rule of Three indirect.

But when the questions belong to the indirect Rule, multiply the Numerator of the first and second together, and the whole thereof by the Denominator of the third, and the Product shall be the Dividend.

Multiply also the Denominators of the first and second together, and the total thereof by the Numerator of the third, and the Product that ariseth there from shall be the Divisor.

Example.

Example.

If $\frac{2}{5}$ of an Ell cost $\frac{2}{3}$ of a l. what cost $\frac{4}{5}$?

$\frac{4}{5}$ Dividend $\frac{2}{3}$ divisor.

(1 l.
 $\times \circ (1 \frac{1}{3}$ facit.
 $\overline{3} 0$

$\frac{4}{5}$ Ell ——— 1 l. $\frac{1}{3}$ ——— $\frac{2}{5}$ Ell.

$\frac{4}{5}$ Dividend. $\frac{4}{5}$
 $\frac{2}{3}$ Divisor. $\frac{2}{3}$

$\frac{40}{65} \frac{12}{3}$ l. facit.

1 l. ——— Ell ——— 1 l. $\frac{2}{3}$
 $\frac{4}{5}$ $\frac{2}{3}$ $\frac{4}{5}$

$\frac{24}{30} \frac{12}{15} \frac{4}{5}$ Ell facit.

1 l. $\frac{1}{3}$ ——— $\frac{4}{5}$ Ell ——— $\frac{2}{3}$ l.

$\frac{4}{5}$ $\frac{2}{3}$ $\frac{4}{5}$
 $\frac{12}{15}$ $\frac{4}{5}$ $\frac{2}{3}$
 $\frac{24}{30}$ $\frac{12}{15}$ $\frac{4}{5}$

$\frac{24}{60} \frac{12}{30} \frac{6}{15} \frac{2}{3}$ Ell facit.

For proof of these and the following Questions, the same method is to be observed,
 F 4.

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Three in whole Numbers, and exercise themselves well therein, and especially in such Questions as are most plain and easie, till they thoroughly understand the nature of the Rule; by means whereof all other Questions will be more easily wrought, be they never so difficult.

If 6 yards and $\frac{1}{2}$ cost 8 shillings, what cost 9 yards and $\frac{1}{3}$?

facit 11 s. $\frac{19}{12}$.

If 1 Dollar be 56 pence $\frac{2}{3}$, what 500 Dollars?

1—56 d. $\frac{2}{3}$ —500 *facit* 117 l. 18 s. $\frac{1}{3}$

If 2 Ounces and $\frac{1}{2}$ cost 16 s. 5 d. what cost $2\frac{2}{3}$?

facit 59 d. $\frac{11}{10}$.

When the Bushel of Wheat is sold for 6 s. $\frac{3}{4}$, the half penny white loaf shall weigh $5\frac{3}{12}$: I demand how much it ought to weigh when the Bushel is sold for 7 s. $\frac{1}{2}$?

6 s. $\frac{3}{4}$ — $5\frac{3}{12}$ —7 s. $\frac{1}{2}$
facit $5\frac{3}{4}$.

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If 2 yards cost 9s. what cost 4 yards $\frac{2}{3}$?
facit 43s. $\frac{1}{2}$.

If 3 Ells $\frac{1}{4}$ cost 15d. $\frac{1}{4}$ what cost 6 Ells $\frac{3}{4}$?
facit 2 s. 7d. $\frac{35}{32}$.

If $\frac{3}{4}$ of a yard cost $\frac{4}{9}$ of a l. what cost $\frac{11}{13}$ of a yard?
facit 10s. $\frac{12}{351}$.

If 3 yards and $\frac{2}{11}$ cost 4l. 14s. $\frac{24}{45}$, what cost $\frac{6}{7}$ of an Ell *Flemish*?

$\frac{602}{11}$ $\frac{4224}{45}$ $\frac{72}{7}$ *facit.* 17s. $\frac{113328}{19155}$

If 1 lb. cost 6d. $\frac{1}{3}$, what cost 4 l. $\frac{5}{6}$?
facit 30d. $\frac{11}{18}$

If 1 Ell $\frac{1}{2}$ cost 9s. $\frac{1}{3}$, what cost 1 yard?
facit 4s. $\frac{1}{16}$.

I lent my Friend $\frac{2}{3}$ of a *French* Crown for three weeks, that he should do as much for me another time: but when I came to borrow of him, he could lend me but $\frac{3}{5}$ of a Crown: I demand how long time I must keep his money to requite my former kindness?

facit 4 weeks $\frac{1}{6}$.

If a Pistolet be 5 s. $\frac{2}{10}$, what shall 430 be thus,

$$1 \text{ --- } 5 \text{ s. } \frac{2}{10} \text{ --- } 430 \text{ facit } 126 \text{ l. } 17 \text{ s.}$$

If 13 lb. cost me 3 l. how many lb. shall I have for 97 d.

$$\text{facit } 1 \text{ lb. } \frac{441}{725}$$

If $\frac{3}{4}$ lb. cost 9 d. $\frac{3}{4}$, what cost 6 lb. 9 $\frac{3}{4}$?

$$\text{facit } 342 \frac{1}{16}.$$

If 5 yards of Velvet cost 4 l. 3 d. $\frac{1}{4}$, what cost 4 yards $\frac{6}{7}$?

$$\text{facit } 3 \text{ l. } 17 \text{ s. } 11 \text{ d. } 2 \text{ qrs. } \frac{22}{85}.$$

If 1 C. $\frac{5}{7}$ cost 4 l. 12 s. what cost $\frac{5}{8}$ C. ?

$$\frac{12}{8} \text{ --- } 92 \text{ s. --- } \frac{5}{8} \text{ facit } 33 \text{ s. } \frac{13}{24}?$$

If 1 C. cost 11 l. $\frac{8}{110}$, what cost 4 $\frac{3}{4}$?

$$\frac{7152}{4} \frac{3}{5} \text{ --- } \frac{1218}{110} \text{ --- } \frac{17}{4} \frac{3}{5}?$$

If $\frac{2}{7}$ of an Ell cost 1 l. 2 s. what cost $\frac{3}{8}$?

$$\text{facit } 32 \text{ s. } 1 \text{ d.}$$

If 10 Ells cost 3 l. $\frac{2}{5}$, what cost 1 yard ?

$$\frac{50}{5} : \frac{18}{5} : \frac{4}{5} \text{ or } 50 \text{ --- } 18 \text{ --- } 4$$

If $\frac{1}{4}$ C. cost $\frac{6}{11}$ of l. what cost 1 C. $\frac{6}{7}$?

$$\frac{1}{4} \text{ --- } \frac{6}{11} \text{ --- } \frac{12}{7} \text{ facit.}$$

If $\frac{3}{4}$ of C. cost $\frac{6}{13}$ lb. what will 3 s. $\frac{1}{8}$ buy?
 $\frac{122}{13}$ s. ——— $\frac{3}{8}$ C. ——— $\frac{31}{8}$ s. *facit.*

If $\frac{3}{4}$ of a yard of Cloth in length, and
 1 yard $\frac{3}{4}$ broad make a Childs Coat, I de-
 mand how much stuff will make the same
 Child a Coat, when the stuff is but $\frac{3}{4}$ of a
 yard broad?

7 ——— 3 ——— 3 *facit* 1 yard $\frac{11}{13}$?

If 8 lb. $\frac{3}{4}$ cost 2 l. 11 s. $\frac{3}{4}$, how many lb.
 shall I buy for 4 l. $\frac{1}{2}$?

facit.

If $\frac{3}{4}$ of 1 C. cost $\frac{1}{12}$ of l. what cost, 5 of
 a pound?

facit.

If $\frac{3}{4}$ of a $\frac{3}{4}$ cost $\frac{11}{12}$ of a penny, how much
 shall I buy for $\frac{6}{11}$ of 20 s?

facit.

If $\frac{1}{12}$ of a pound cost $\frac{1}{11}$ of l. how many
 pounds shall I have for 2 l. 7 s. 3 d. $\frac{1}{2}$?

facit.

How many yards are bought for 142 l.
 11 s. 2 d. when the $\frac{1}{2}$ of $\frac{3}{4}$ of a yard cost
 6 s. 3 d? *facit.*

If 1 C. $\frac{3}{4}$ 12 lb. $\frac{1}{3}$ cost 2 l. $\frac{2}{3}$, what cost $\frac{2}{3}$ of an $\frac{3}{4}$?

facit $540\frac{351}{550}$.

If 26 lb. at *Antwerp* be 27 lb. $\frac{7}{8}$ at *London*, how many pounds at *Antwerp* are 56 lb. at *London*?

facit $52\frac{52}{225}$.

If 8 Ells at *Antwerp* be 5 Ells $\frac{1}{3}$ at *London*, how many Ells at *Antwerp* are 130 Ells $\frac{1}{11}$?

facit 231 Ells $\frac{107}{143}$.

If $3\frac{1}{2}$ times $3\frac{1}{2}$ lb. cost $1\frac{1}{2}$ times $1\frac{1}{2}$ l. what shall amount unto $\frac{1}{2}$ times $\frac{1}{2}$ of the $\frac{1}{3}$ of 12 l. $\frac{1}{4}$

$\frac{42}{4} - \frac{2}{4} - \frac{48}{48}$ facit $\frac{147}{24}$ of a l.

If $\frac{1}{3}$ less $\frac{1}{2}$ lb. cost $2\frac{1}{4}$ l. and the $\frac{1}{2}$ of $\frac{7}{9}$ lb. what shall 10 lb. less $\frac{1}{3}$ and $\frac{1}{4}$ of $3\frac{1}{2}$ lb. amount unto?

$\frac{1}{6} - \frac{172}{64} - \frac{331}{40}$ facit 135-17-0-3

If a *French* Crown be worth 52 d. $\frac{5}{11}$

sterl. how many must be received for 100 l. sterl.

Crown.
 $\frac{1155}{11}d. - \frac{1}{1} - \frac{72560}{3}$
facit 460 Cr. $\frac{44}{3}$

When

110 *The Rule of Three, &c. Chap. XIV.*

When $\frac{1}{5}$ of 5 Ells less $\frac{1}{5}$ of an Ell cost $\frac{1}{8}$ of $9\frac{1}{2}l.$ less $\frac{1}{8}$ of a $l.$ what then shall $\frac{1}{8}$ of 6 Ells less $\frac{1}{8}$ of an Ell?

$$\frac{4}{5} \quad \frac{17}{15} \quad \text{---} \quad \frac{2}{8} \text{ facit } 1\frac{41}{384}l.$$

If $\frac{2}{3}$ of 20 lb cost 36 $l.$ less $\frac{3}{4}$ of 30 $l.$ I demand to how much $\frac{2}{8}$ of 40 lb and $\frac{1}{2} \frac{2}{3} \frac{3}{4}$ will amount unto?

$$\frac{40}{3} : \frac{27}{2} : \frac{2538}{72} \text{ facit } 35\frac{221}{320}l.$$

If an Ingot of silver, whose weight is 60 lb. $\frac{5}{7}$ better 16 $\frac{3}{5}$ I demand the Standard weight of the Ingot, also the betterness; note, that the Standard is 11 $\frac{3}{4}$ 2 dwt. First, subtract the Standard weight from the betterness, then it follows:

$$\frac{111}{10} : \frac{491}{90} : \frac{5100}{7}$$

3.

358 $\frac{202}{2331}$ betterness.

728 $\frac{1232}{2331}$ weight of the Ingot.

1086 $\frac{1534}{2331}$ standard weight in ounces.

— — — lb. 3. dwt.

$$90 : 6 : 13\frac{277}{2331} \text{ facit.}$$

An Ingot of silver, weight 47 $\frac{3}{4}$ lb. and is worse 14 $\frac{1}{2}$ 3. I demand the worseness of the Ingot, also the Standard weight.

$$\frac{111}{10} : \frac{46}{10} : \frac{573}{1}$$

lb. 13—02 3.—6 dwt. $\frac{114}{117}$ worseness fa.

lb. 34—06 3.—13 dwt. $\frac{97}{111}$ standard fa.

CHAP.

CHAP. XV.

Rules of Practice.

Tables of Practice.

s. d.					
The even parts of a pound.	10—0	is	$\frac{1}{2}$	The even parts of a shilling.	d.
	6—8	is	$\frac{1}{3}$		6 is $\frac{1}{6}$
	5—0	is	$\frac{1}{4}$		4 is $\frac{1}{3}$
	4—0	is	$\frac{1}{5}$		3 is $\frac{1}{4}$
	3—4	is	$\frac{1}{6}$		2 is $\frac{1}{6}$
	2—6	is	$\frac{1}{8}$		1½ is $\frac{1}{8}$
	1—0	is	$\frac{1}{20}$		1 is $\frac{1}{12}$

BEfore the Learner can well proceed further, he must get these Tables very perfectly by heart; I might puzzle his Head with some others, which because I conceive would be troublesome and burdensome to his memory, therefore I shall omit

2—12—24
3—12—36
4—12—48
5—12—60
6—12—72
7—12—84
8—12—96
9—12—108
10—12—120
11—12—132
12—12—144
them

them and observe this plain and easie method following.

And first, I shall begin with the even parts of a shilling.

1. When the price is an even part of a shilling, consider what part of a shilling it is; which being found, divide the Sum propounded by it, and the Quotient will be shillings: As in these six Examples following will appear.

Ells. d.		lb. d.	
$\frac{1}{2}$	8468 at 6 per Ell	$\frac{1}{2}$	3618 at 2 per lb.
423 4		60 3	
211-14-0 facit.		30-3 facit.	
$\frac{1}{3}$	867 at 4 d. per Ell	ards. d.	
28 9		$\frac{1}{2}$	760 at 1 $\frac{1}{2}$ per y.
14-9-0 facit.		14 5	
lb.		17-5 facit.	
$\frac{1}{4}$	276 at 2 d. per lb.	lb. d.	
6 9		$\frac{1}{12}$	396 at 1 per lb.
3-9 facit.		60 8	
		20-8 facit.	

Having

Having gone thus far upon those even parts of a shilling that are most easie, I must intreat the Learner to return back to a farthing, an half penny, three farthings, &c. the other parts of a shilling.

II. When the price is Farthings, or Half-pence, bring the given Sum into Pence, and work as before in the last Question; but when they are uneven parts, as peny-farthing, peny-three-farthings, two-pence-farthing, or the like: Begin first with the even parts of a shilling: As for instance, 6396 Ells at 5 Farthings per Ell; work first for the peny, as before, then consider, if at the price of a peny they come to so many shillings, then the Farthings must be the fourth part of them, which being taken added together, your work is done.

<i>Ells.</i>		<i>Ells.</i>	
$\frac{1}{4}$	420 at $\frac{1}{4}$ d. per Ell	$\frac{1}{2}$	716 at $\frac{1}{2}$ d. per Ell.
<hr/>		<hr/>	
$\frac{1}{12}$	105	$\frac{1}{12}$	358
<hr/>		<hr/>	
8-9 d. facit.		2 9-10 d.	
<hr/>		<hr/>	
		1-9-10 facit.	

Ells

<i>Ells.</i>	<i>d.</i>		<i>Ells.</i>	<i>d.</i>
$\frac{1}{2}$ 6396	at $\frac{3}{4}$ per Ell.		$\frac{1}{8}$ 7225	at $1\frac{3}{4}$ per Ell.
$\frac{1}{12}$ 3198			$\frac{1}{6}$ 903	— $1\frac{1}{2}$
$\frac{1}{2}$ 266	— 6 <i>d.</i>		150	— $6\frac{1}{4}$
133	— 3		105	3 — $7\frac{3}{4}$
39	9 — 9		52	— 13 — $7\frac{3}{4}$ <i>facit.</i>
19	— 19 — 9 <i>facit.</i>			
$\frac{1}{12}$ 5712	at 1 <i>d.</i> $\frac{1}{4}$			
$\frac{1}{4}$ 476				
119				
59	5			
29	— 15 <i>facit.</i>			

III. When any thing doth remain of any Division, it is of the same Denomination as the Dividend was, as here in the last Example 7225 three half pence being divided by 8, there remains one three half pence.

$\frac{1}{6}$ 864 at 2 d. $\frac{1}{4}$ 44
18

16 | 2

8-2-0 *facit.* $\frac{1}{6}$ 3714 at 2 d. $\frac{1}{2}$

619

154-9

77 | 3-9

38-13-9 *facit.*417 at 2 d. $\frac{3}{4}$

69-6

17-4- $\frac{1}{2}$ 8-8- $\frac{3}{4}$ 9 | 5-6- $\frac{3}{4}$ 4-15-6 $\frac{3}{4}$ *facit.* $\frac{1}{4}$ 3716 at 3 d. $\frac{1}{4}$ $\frac{1}{12}$ 929

77-5

100 | 6-5

50-06-5 *facit.*

lb.

 $\frac{1}{4}$ 41712 at 3 d. $\frac{1}{2}$ $\frac{1}{8}$ 10428

1738

1216 | 6

608-6-0 *facit.* $\frac{1}{4}$ 817 at 3 d. $\frac{2}{4}$ $\frac{1}{4}$ 204-3 d.51-0 $\frac{3}{4}$ 25 | 5-3 $\frac{3}{4}$ 12-15-3 $\frac{3}{4}$ *facit.*

$\frac{1}{2}$ 7138 at 4 d. $\frac{1}{4}$.	$\frac{1}{3}$ 712 at 5 d.
$\frac{1}{8}$ 1189—8	$\frac{1}{4}$ 237—4
1189—8	59—4
148—8 $\frac{1}{2}$	29 6—8
252 8—0 $\frac{1}{2}$	14-16-8 <i>facit.</i>
126-8—0 $\frac{1}{2}$ <i>facit.</i>	$\frac{1}{2}$ 3716 at 7 d.
$\frac{1}{3}$ 5171 at 4 d. $\frac{1}{2}$	1858
$\frac{1}{8}$ 1723—8	309—8
215—5 $\frac{1}{2}$	216 7-8
193 —9-1 $\frac{1}{2}$	108-7-8 <i>facit.</i>
96-19-1 $\frac{1}{2}$ <i>facit.</i>	$\frac{1}{3}$ 8716 at 3 d.
$\frac{1}{3}$ 971 at 4 d. $\frac{3}{4}$	2905—4
$\frac{1}{8}$ 323—8	2905—4
$\frac{1}{2}$ 40—5— $\frac{1}{2}$	581 0—8
20—2— $\frac{1}{4}$	290-10-8 <i>facit.</i>
38 4—4— $\frac{1}{4}$	
19, 14-4 $\frac{3}{4}$ <i>facit.</i>	

$\frac{1}{2}$	6371 at 9 d.		2716 at 12 d.
$\frac{1}{2}$	3185—6		271 6
	1592—9		l. 135-16 s. facit.
	477 8—3	$\frac{1}{2}$	3762 at 12 d. $\frac{1}{4}$
	238-18-3 facit.		
$\frac{1}{2}$	846 at 10 d.	$\frac{1}{2}$	1881
			940—6
$\frac{1}{2}$	423	$\frac{1}{12}$	940—6
$\frac{1}{2}$	211—6		78—4 $\frac{1}{4}$
	70—6		384 0—4 $\frac{1}{2}$
	70 5—0		192--0—4 $\frac{1}{2}$ facit.
	35-5—0 facit.		
$\frac{1}{2}$	4687 at 11 d.		
$\frac{1}{2}$	2343—6		
$\frac{1}{4}$	1562—4		
	390—7		
	429 6—5		
	214-16-5 facit.		

5627 Ells at 13 d. per Ell.

IV. As for the 12 d. that is done to your hand, there being so many shillings as there are Ells: then for the penny, consider that 12 d. per Ell it comes to so much, and the odd penny take $\frac{1}{12}$ of the given sum, which will make likewise shillings. And thus you may do touching any of the following Questions, taking the even or uneven parts, as you have learned before.

$\frac{1}{12}$	2684 at 13 d.		$\frac{1}{4}$	7684 at 15 d.
$\frac{1}{12}$	2684		$\frac{1}{4}$	7684
	223—7			1921
	290 7—7			960 5
	l. s. d.			480 5 facit.
	145-7—7 facit.			
	8642 at 14 d.			3716 at 16 d.
$\frac{1}{6}$	8642		$\frac{1}{3}$	3716
	1440—4			1238—8d.
	1008 2-4			495 4—8
	504-2-4 facit.			247-14-8 facit.

3141 at 17 d.

417 at 21 d.

1236 at 18 d.

1021 at 22 d.

26812 at 19 d.

317 at 23 d.

1213 at 20 d.

1712 at 2 s.

V. Observe that as many yards as there are, so many two shillings; therefore multiply by 2, and the product are shillings: and this method you may observe in all others.

Or this, if you will.

For those even parts of a pound that are most familiarly known, as two shillings, you may take the $\frac{1}{10}$ for 2 shillings and 6 pence the $\frac{1}{8}$ for three shillings and 8 pence the $\frac{1}{6}$ for 4 shillings the $\frac{1}{5}$ for 5 shillings the $\frac{1}{4}$ for 6 shillings and 8 pence the $\frac{1}{3}$ for 10 shillings the $\frac{1}{2}$.

lb. $1712 \text{ at } 2 \text{ s. per lb.}$ <hr/> 2 <hr/> 3424 <hr/> $171 \text{ l.} - 4 \text{ s. facit.}$ Ells. $\frac{1}{12} 7260 \text{ at } 2 \text{ s. } 1 \text{ d.}$ <hr/> 2 <hr/> $\frac{1}{2} 14520$ <hr/> 605 <hr/> $1512 5$ <hr/> $756-5 \text{ s. facit.}$ $412 \text{ at } 2 \text{ s. } 3 \text{ d.}$ <hr/> $106 \text{ at } 2 \text{ s. } 4 \text{ d.}$ <hr/> $171 \text{ at } 2 \text{ s. } 5 \text{ d.}$ <hr/>	$\frac{1}{8} 3672 \text{ at } 2 \text{ s. } 2 \text{ d.}$ <hr/> 2 <hr/> 7344 <hr/> 612 <hr/> $795 6$ <hr/> $\text{l. } 397-16 \text{ s. facit.}$ <p>pence be re- quired in the <i>que- stion</i>, the parts for pence take out of the given sum, as in these three last Examples do ap- pear.</p> $1410 \text{ at } 2 \text{ s. } 6 \text{ d.}$ <hr/> $712 \text{ at } 2 \text{ s. } 7 \text{ d.}$ <hr/> $100 \text{ at } 2 \text{ s. } 8 \text{ d.}$ <hr/>
---	--

6101 at 2 s. 9 d.
<hr/>
1006 at 2 s. 10 d.
<hr/>

6109 at 2 s. 11 d.

4672 Ells and $\frac{1}{2}$ at 4 d. and 4. d. per Ell.

Questions of this nature that do consist of several Denominations, as $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, &c. are wrought as before, only for the half Ell, take half of the given price of an Ell, &c. for a quarter, take a quarter of the price, &c. and add it to the former Sum.

Example.

Ells.
$\frac{1}{2}$ 4672 $\frac{1}{2}$ at 4 s. 4. d. $\frac{1}{2}$
4 2 2
<hr/>
18688
1557—4 d.
2—2
<hr/>
2024 7—6
<hr/>
1012—7—6 facit.

C.	s.	d.
17 $\frac{1}{4}$	at	17-7 per C.
17		
<hr/>		
119	4-4 $\frac{3}{4}$	
17		
8—6		
1—5		
4—4 $\frac{3}{4}$		
<hr/>		
30 3—3 $\frac{3}{4}$		
<hr/>		
15-3—3 $\frac{3}{4}$		

G

VII. IF

VII. If the price required be concerning pounds neat, you must reduce the hundreds gross into pounds gross, and subtract the pounds tare from them, and the remains will be pounds neat.

32 C. gross, tare
172 lb. at 7 d. per
lb. neat.

32
112

64
32
32

3584 lb. gross.
172 lb. tare.

3412 lb. neat.
lb. d.

$\frac{1}{2}$ 3412 at 7 per lb.

$\frac{1}{12}$ 1706
284—4 d.

199|0—4 d.

29.10—4 facit.

36 C. gross, tare
94 lb. at 14. d. per
lb. neat.

36
112

72
36
36

4032 lb. gross.
94 lb. tare.

3938 lb. neat.
lb. d.

3338 at 14 per lb.

$\frac{1}{6}$ 3938
656—4 d.

459|4 4 d.

229-14-4 facit.

VIII.

VIII. Again, observe whether the pounds tare be absolutely so much as in the last Example, or whether it be so much *per Bag*, *per C.* or *Barrel*, &c. If it be any of these, multiply the tare given by the C. Bag, or Barrel, and the Product will be pounds tare, which subtract from the pounds gross, and the remains are pounds neat.

Example.

56 C. gross, tare
17 lb. per C. at 9 d.
per lb. neat.

56	56
112	17

122	392
56	56

56	952
----	-----

6272 lb. gross.

952 lb. tare.

5320 lb. neat.

d.

5320 lb. at 9 per lb.

2660

1330

3990

199-10 facit.

12 C. gross, tare
13 lb. per C. at
18 d. per lb. neat.

12	12
112	13

24	36
12	12

12 lb. tare.	56.
--------------	-----

1344 lb. gross.

156 lb. tare.

1188 lb. neat.

d.

1188 at 18. per lb.

594

1782

89-20 facit.

G 2

IX.

IX. Observe whether the given price required be at so much *per C.* if so, then bring your pounds Tare into *C.* and subtract them from the *C.* gross.

Example.

17 C. Gross, Tare
11 lb. *per C.* at
15 s. *per C.* Neat.

17
11

17
17

7 (5 C. qrs. lb.
x 87 (1---2---19 ta.
xxx

C. qr. lb.

17—0—0 gross.

1—2—19 tare.

15—1—9 neat.

C. qr. lb.

15—1—9 at 15 *per C.*

15

75

15

225

3—9

1—2 $\frac{1}{4}$

229—11 $\frac{1}{4}$

11—9—11 $\frac{1}{4}$ *facit.*

20 C. Gross, Tare
13 lb. *per C.* at
12 s. *per C.* Neat.

20
13

60
20

260

(3 (6 C. qr. lb.
x 50 (2---1---8 ta.
xxx

C. qr. lb.

20—0—0 gross.

2—1—8 tare.

17—2—20 neat.

C. qr. lb.

17—2—20 at 12 s.

12 (*per C.*

34

17

204

6

2—1 $\frac{1}{2}$

212—1 d. $\frac{1}{2}$

10—12—1 d. $\frac{1}{2}$ *facit.*

X. I think those former Rules well observed, to be sufficient for your Instruction touching Tare, only if the gross hundreds have several species, as $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ odd pounds, or the like, then consider, if one hundred give so much Tare, then a quarter of a C. will give a quarter so much; and if one quarter give so much, 14 pound will give half so much; and if 14 pound give so much, then 7 pound will give half as much, &c.

Example.

13 C. $\frac{1}{2}$ gross,
Tare 12 pound
per C. at 2 s. 3 d.
per pound Neat.

96 C. $\frac{1}{2}$ 14 pound
gross, Tare 13 lb.
per C. at 3 s. 6 d.
per pound Neat.

What Treat is.

XI. Having thus shewed you the way of finding out the Tare, I come in the next place to shew you how to find out the Treat, which is a certain allowance of 4 lb. per 104 lb. upon many sorts of Commodities.

Example.

39 C. Gross, Tare 15 lb. per cent.
4 lb. per 104 lb. Treat, at 4 s. 6 d. per lb. Neat.

G ;

I Bring

1. Bring the C. gross into pounds gross.
2. Multiply the lb. tare by the C. gross, and the product is the pounds tare.
3. Subtract the lb. tare from the lb. gross, and the remain is subtil pounds, which pounds divide by 26, because 26 is contained 4 times in 104, and as often as it is contained, so many pounds Treat there are, which subtract from the subtil pounds, and the remain will be neat pounds.

$$\begin{array}{r}
 \text{C.} \\
 39 \\
 112 \\
 \hline
 78 \\
 39 \\
 79 \\
 \hline
 4368 \text{ lb. gross.} \\
 585 \text{ lb. tare} \\
 \hline
 3783 \text{ lb. subtil.} \\
 145 \text{ lb. treat.} \\
 \hline
 3638 \text{ lb. neat.}
 \end{array}$$

$$\begin{array}{r}
 39 \\
 15 \\
 \hline
 195 \\
 39 \\
 \hline
 585 \text{ lb. tare.} \\
 (1 \\
 \times 144 \text{ lb.} \\
 378(3(145 \text{ treat.} \\
 2666 \\
 22
 \end{array}$$

At 4. s. 6 d. per lb. facit 821 l. 1 s.

Other

Other ways there are to find out the Tare, but I conceive these are the most plain for young Learners: However I shall give them one or two Examples of another manner of working, which is both very commendable and speedy.

1. When the Tare is 14 pound *per cent.* take the $\frac{1}{2}$ part of the pounds gross, and the Quotient will be pounds Tare.

2. When the allowance is Tare 16 *l. per cent.* take $\frac{1}{7}$ part, or divide it by 7. and the Quotient will be pounds Tare.

3. Suppose it were Tare 24 pounds *per cent.* work first for 16 as before, then take the $\frac{1}{2}$ of that which 16 cometh to, for if 16 produce so much, 8 must produce the $\frac{1}{2}$ of that, which being added, will make the pounds Tare for 24 pound *percent.*

Again, suppose it were at 20 pound *per cent.* you may work first for 16, and then 4 will be the $\frac{1}{4}$ of that Quotient, which being added, maketh the total of your pounds Tare for 20 pound *per cent.*

Again, suppose it were for 12 pound *per cent.* Tare, work as before for 16, which Quotient is for 4 too much, therefore take the $\frac{1}{4}$ of that, and subtract from that of 16, and the remains will be pounds Tare, or 12 pound *per cent.*

Again, suppose it were 7 pounds *per Cent.* tare, work for 14, and if 14 comes to so much, then 7 will be $\frac{1}{2}$ of that: and you may with ease work all questions of this kind, by making 14 or 16 your standing Rule, adding and subtracting the part or parts of it more or less, as occasion requires. I might say more as to this, but shall forbear, only I will give you two or three Examples ready cast up, and state a few others to exercise your Ingenuity therewith.

48 C. Gross. Tare 14 lb. *per cent.* at
10 d. $\frac{1}{2}$ *per lb.* Neat.

C.	
48	4704 lb. at 10 d. $\frac{1}{2}$ <i>per lb.</i>
112	
<hr/>	
96	
48	
48	
<hr/>	
$\frac{1}{3}$ 5376 lb. <i>gross.</i>	
672 lb. <i>tare.</i>	
<hr/>	
4704 lb. <i>neat.</i>	

56 C. $\frac{1}{4}$ gross, tare
16 pound *per cent.*
at 9 *d* *per* pound
Neat.

C.

56 $\frac{1}{4}$

4

225

28

1800

450

 $\frac{1}{7}$ 6300 lb. gross.

900 lb. tare.

d.
 $\frac{1}{2}$ 5400 lb. neat at 9

 $\frac{1}{2}$ 2700

1350

405|0

202-10-0 *facit.*

97 C. $\frac{3}{4}$ 11 pound
gross, tare 24 lb.
per cent. at 5 *d.* *per*
pound Neat.

97 $\frac{3}{4}$ 11

4

391

28

3129

783

 $\frac{1}{7}$ 10959 lb. gross.

 $\frac{1}{2}$ 1565

782

2347 lb tare.

 $\frac{1}{2}$ 8612 lb neat 5 *d.*
 $\frac{1}{4}$ 2870—3

717—8

358|8—4

179-8—4 *facit.*

G 5

19 C.

19 C. $\frac{1}{4}$ 11 pound
Gross, Tare 18
pound per Cent.
at 7 d. $\frac{1}{2}$ per lb.
Neat.

34 C. $\frac{1}{4}$ 19 pound
Gross, Tare 7
pound per cent. at
11 d. per lb. neat.

13 C. $\frac{1}{2}$ Gross,
Tare 22 pound
per cent. at 16 d.
per pound neat.

20 C. $\frac{1}{2}$ 13 pound
Gross, Tare 12
pound per sent. at
10 d. per pound
neat.

86 C. $\frac{1}{2}$ 13 pound
Gross, Tare 13
pound per cent. at
8 d. per lb. neat.

19 C. $\frac{1}{4}$ 19 pound
Gross, Tare 19 lb.
per cent. at 18 d.
per lb. neat.

C H A P. XVI.

The Double Rule of Three.

HAVING somewhat at large insisted upon the two last Rules, viz. The Rule of Three and Practice, I come to the second Rule of Proportion, commonly called *The Double Rule of Three*, which hath its denomination from its double working: And as I did in the former Rule of Three proceed with one plain and easie working of the same either direct or indirect: So I shall here also observe the same Order; but here first a diligent heed must be had unto the stating of the Question, because under this Rule are comprehended divers Rules of *Plural Proportion*. Therefore observe as in the former Rule of Three, so in this.

1. That first and third numbers be both of one species, viz. if the first number be Principal, the third must be Principal; if the first be Interest, the third must be Interest.

If the first be time, the third must be time;
if the first be men, the third must be men.

2. Ob.

2. Observe that the two first terms in the Question do consist of a supposition, and the third term of demand.

Example.

If 100 *l.* in 12 months gain 6 *l.* what shall 276 *l.* gain in 18 months?

1. Here you see the supposition is,
If 100 *l.* gain 6 *l.*

2. The demand is, what will 276 *l.* gain?

100 <i>l.</i>	— — — — —	6 <i>l.</i>	— — — — —	276 <i>l.</i>
		20		1440
		120		11040
		12		1104
		— — — — —		276
		1440		— — — — —

Cut off the two first figures, and the rest are pence, viz. 3974 *d.*

3974|40

Then say,

If 12 *mon.* — 3974 *d.* — what 18 *mon.*
facit 5961 *d.*

If 6 Clerks can write 45 sheets of paper in 5 days, how many Clerks can write 300 sheets in 15 days after that proportion?

Sheets.

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$$\begin{array}{rcl}
 \text{Sheets.} & \text{Clerks.} & \text{Sheets.} \\
 45 & \text{---} 6 & \text{---} 300 \\
 & & 6 \\
 & & \hline
 & & 1800
 \end{array}$$

$\times 800$ (40 Clerks.

458

4

$$\begin{array}{rcl}
 \text{Days.} & \text{Clerks.} & \text{Days.} \\
 5 & \text{---} 40 & \text{---} 13^* \\
 & 5 & \\
 & \hline
 & 200
 \end{array}$$

* Observe here, and so in others, whether the demand be more or less, and work as hath been taught.

7 (5 Clerks.
 $\times 200$ (15 $\frac{1}{2}$ facit.
 $\times 33$
 \times

If the Carriage of 56 C. weight 100 miles cost 14 l. what will 13 C. cost being carried 29 miles, after that rate?

$$\begin{array}{rcl}
 \text{C.} & \text{lb.} & \text{C.} \\
 56 & \text{---} 14 & \text{---} 13 \\
 & & 14 \\
 & & \hline
 & & 52 \\
 & & 13 \\
 & & \hline
 & & 182
 \end{array}$$

(14
 $\times 82$ (3 l. 5 s.
 56

If

If 100 miles — 3^l. — 5 s. — 29 miles.

20	65
<hr/>	<hr/>
65	145
	174
	<hr/>
	18 85

facit 18 s. $\frac{17}{20}$

If 8 Taylors make four Suits of Cloaths in 10 days, how many will make 15 Suits in 14 days?

If 4 Suits require 8 Taylors, what will 15 Suits require?

x 2.0 (30 *facit*
44

120

If 10 days — 30 Ta. — 14 da.

30

300

x

2(6

3.0.0 (21 $\frac{3}{7}$.

x 44

x

Of what Principal was 150 l. gained in 19 months, when 100 l. in 12 months gained 6 pound?

facit 1578 l. $\frac{18}{12}$ Principal
How.

How long time was 900 *l.* a gaining 420 *l.* when 6 *l.* was gained of 100 *l.* in 12 months?

facit 93 months $\frac{1}{3}$.

A Scrivener lent 700 *l.* at Interest the 22 of October 1639, and upon the 9th. of Decemb. 1645. received for Interest thereof 330 *l.* I demand at what price per cent. per annum it was lent?

The time is 6 years,

1 month, 17 days.

*facit 7 *l.* $\frac{10837}{1565}$.*

If I sow 20 Bushels of Pease, and they produce in one year 276 Bushels, I demand how many Bushels in 6 years will 90 Bushels produce after that proportion?

facit 7452 Bushels.

What is the Principal that gained 476 *l.* in 16 months, when 100 *l.* in 12 months gained 6 *l.*?

*5950 *l.* Principal.*

In what time was 850 *l.* gained of 940 pounds, when 100 *l.* in 12 months gains 6 pounds?

facit 15 years, 25 da. $\frac{25}{47}$.

If 100 *l.* in 12 mon. gained 6 *l.* what monies was that which gave me in 8 months 10 pounds?

*facit 250 *l.* Principal.*

IF

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If 4 s. 8. d. pay 1 Soldier for 1 week,
how many Dollars at 4 s. 2 d. will pay 80
Men for one month?

facit 358 Dollars $\frac{1}{3}$.

An Usurer lent the 11 of July 1647. a
sum of money at Interest for 6 l. *per cent.*
and on the 27 of Feb. 1651. received for In-
terest thereof 318 l. 12 s. I demand what
was the sum lent?

*The time between
the 11th. of July 47.
to the 27 of Feb. 51.
is four years, 7 mon.
16 days.*

facit 1148 l. $\frac{226}{1658}$.

If 10 Brick-layers make a Wall of 100
foot long, and 20 foot high in 12 days,
how many Brick-layers will make a Wall
of 236 foot long, and 20 foot high in 16
days?

facit 17 men $\frac{1}{2}$.

CHAP. XVII.

*A most brief and compendious way of working
all manner of Questions upon Interest.*

Example.

First, state your Question thus :

If 100 l. gain 6 l. what the Principal?

2. Multiply the second and third numbers together, and divide by your first, which is done by cutting off the two first figures of the pounds with a line.

3. Multiply them by 20, by 12, and 4, and all above two figures in each Multiplication, carry over the line to the left, as you see in these following Examples.

If 100 l. in 12 months gain 6 l. what will 356 l. gain in 18 months?

If 100 l. gain 6 l. what ———— 356 l.

	l.	s.	d.
12 mon. fa.	21—	07—	2 $\frac{1}{4}$
6 mon. fa.	10—	13—	7
	<hr/>		
	32—	00—	9 $\frac{1}{4}$

21	36
	20
<hr/>	
7	20
	12
<hr/>	
2	40
	4
1	60
<hr/>	
275 l.	

275 *l.* let out for three years, at 6 pound
per cent. per annum.

$$100 \text{ --- } 6 \text{ --- } 275$$

6

	<i>l.</i>	<i>s.</i>	<i>d.</i>		16	50
1 year facit	16	10	0	Then		20
			3			

3 years will be }	10	00
3 times this sum }		

236 *l.* 10 *s.* 5 *d.* let out for 16 months,
at 6. *l.* per cent. per annum.

$$100 \text{ l. --- } 6 \text{ --- } 236 \text{ --- } 10 \text{ --- } 5$$

6

	<i>mo.</i>	<i>lb.</i>	<i>s.</i>	<i>d.</i>		14	19	02	6
facit in 12:	14	3	9	$\frac{3}{4}$			20		
$\frac{1}{3}$	4	14	7	$\frac{1}{4}$					

	3	82
<i>mo.</i>		12
facit in 16:	18	18
	4	90
		4
	3	60

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The same order observe for Interest upon Interest; only add the last Interest to the third number of the last question, and work as before in these Examples following.

417 *l.* 11 *s.* 8 *d.* let out for four years, at 6 *l.* per cent. per annum, Interest upon Interest.

$$100 \text{ l.} \text{ --- } 6 \text{ l.} \text{ --- } \begin{array}{r} \text{l.} \quad \text{s.} \quad \text{d.} \\ 417 : 11 : 8 \\ 6 \end{array}$$

$$\begin{array}{r} \hline 25 \mid 05 : 10 : 0 \\ 20 \end{array}$$

facit 25 *l.* 1 *s.* 1 *d.*

$$\begin{array}{r} \hline 1 \mid 10 \\ 12 \end{array}$$

$$\begin{array}{r} \hline 1 \mid 20 \\ 4 \end{array}$$

80

Multiply second and third Numbers together, saying, 6 times 8 pence is 48 pence, which is 4 shillings, set down 0 and carry 4 to the shillings, saying, 6 times 11 is 66, and 4 that I carried is 70 shillings; set down the 10 *s.* and carry 3 to the pounds, saying, 6 times 7 is 42, and 3 that I carried is 45, set down 5, and

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and carry 4, saying, 6 times 1 is 6, and 4 that I carried is 10, set down 0 and carry 1, saying 6 times 4 is 24, and 1 that I carried is 25, which set down, and cut off the two first Figures of the pounds, and multiply as before, and the Product will be according to the Examples, 25 *l.* 1 *s.* 1 *d.* simple Interest for the first year, the which add to your former Principal 417 *l.* 11 *s.* 8 *d.* and it will make 442 *l.* 12 *s.* 9 *d.* Then state your Question again, saying,

l. s. d.

If 100 *l.* ——— 6 *l.* ——— 442 — 12 — 9
6

—————
26 | 55 — 16 — 6 —
20

l. s. d. q.

2 *d.* year 26 — 11 — 1 — 3

11 | 16
11 | 16
12

—————
1 | 98
4

—————
3 | 92
l. s. d.

Add this Interest unto the 442-12-09
and it will make ——— 469-03-10 $\frac{3}{4}$
Then

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Then state your Question again, and work as before, saying,

$$100 \text{ l.} \text{ --- } 6 \text{ l.} \text{ --- } \begin{array}{r} \text{l.} \quad \text{s.} \quad \text{d.} \\ 469 \text{ --- } 3 \text{ --- } 10 \frac{3}{4} \\ 6 \end{array}$$

$$3 \text{ d. year } \begin{array}{r} \text{l.} \quad \text{s.} \quad \text{d.} \\ 28 \text{ --- } 3 \text{ --- } 0 \frac{1}{4} \end{array} \quad \begin{array}{r} 28 \mid 15 \text{ --- } 3 \text{ --- } 4 \frac{1}{2} \\ 20 \end{array}$$

Which $28 \text{ l. } 3 \text{ s. } 0 \text{ d. } \frac{1}{4}$ add
unto the $469 \text{ l. } 3 \text{ s. } 10 \text{ d. } \frac{3}{4}$
facit $497 \text{ l. } 6 \text{ s. } 11 \text{ d.}$ then
state your Question again,
and work as before, saying, $1 \mid 62$

$$100 \text{ l.} \text{ --- } 6 \text{ l.} \text{ --- } \begin{array}{r} \text{l.} \quad \text{s.} \quad \text{d.} \\ 497 \text{ --- } 6 \text{ --- } 11 \\ 6 \end{array}$$

$$29 \mid \begin{array}{r} 84 \text{ --- } 1 \text{ --- } 6 \\ 20 \end{array}$$

Which being added to
the $497 \text{ l. } 6 \text{ s. } 11 \text{ d.}$ *facit*
 $527 \text{ l. } 3 \text{ s. } 8 \text{ d. } \frac{3}{4}$, Interest
upon Interest for 4 years
at 6 l. per cent. per annum.

$$16 \mid \begin{array}{r} 81 \\ 12 \end{array}$$

$$9 \mid 78$$

$$4$$

$$3 \mid 12$$

And

And thus you may in a brief manner work all questions of this nature. Other ways of working there are, of which I shall give you two or three Examples, and leave them to your consideration.

Example.

I demand how much the Interest of 819 $\frac{1}{2}$ will amount unto for 3 years, 7 months, 18 days, after 6. *l.* per cent. per annum, Interest upon Interest.

If

1.
S,
-

20

12

106

196500

106

2083530

106

2208540

106

2341050

234105 which subtr. the 3d,

7023: 6 mo.

585: 15 days.

117: 3 days.

234105: third year.

facit 243000 d.

A Table

A Table to find out what any Sum 'of Money will amount unto for 21 years, or under, at 6 l. in the Hundred, Interest upon Interest.

	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>q.</i>	
1	1—	1—	2—	1	The Table is so plain, that I suppose it needs very little demonstration, I shall therefore only give you one or two Examples.
2	1—	2—	5—	2	
3	1—	3—	9—	3	
4	1—	5—	3—	0	
5	1—	6—	9—	0	
6	1—	8—	4—	1	
7	1—	10—	0—	3	As,
8	1—	11—	1—	2	
9	1—	13—	9—	1	If you would know what 36 l. comes to, Interest upon Interest, for 20 years.
10	1—	15—	9—	3	
11	1—	17—	11—	2	
12	2—	0—	2—	3	Look against Number 20 in the first Column, and you will find what the Interest upon Interest of one pound comes to for that time. Then say, by the Rule of Three.
13	2—	2—	7—	3	
14	2—	5—	2—	2	
15	2—	7—	11—	0	
16	2—	10—	9—	2	
17	2—	13—	10—	0	
18	2—	17—	0—	3	
19	3—	0—	5—	3	
20	3—	4—	1—	2	
21	3—	7—	11—	2	

If 1 l.—3 l.—4 s.—1 d. 2 q.—36 l.

If

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I desire to know how much 346 pound will amount unto in 13 years, Interest upon Interest, at 6 pounds *per cent*.

Look against Number 13 in the first Column, and you will find

l. s. d. q.
2—2—7—3

Then say as before,

l. s. d. q.
If 1 be—2—2—7—3—346
20

42
12

511
4

2047 *qr.*
346

12282
8188
6141

708262

82 2(2
828262
444444

5966
(87706(5(1475)5
828282

828282
828282 737—15—5 *fa.*
H

A very brief and necessary Table to find out the present worth of the Annuity or Yearly Rent for 21 Years or under, after the rate of six pound per cent. per annum.

<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>q.</i>		
1	00	18	10	2	For the understand-
2	01	16	08	0	ing of this Table, the
3	02	13	05	2	same order is to be ob-
4	03	09	03	2	served with the former:
5	04	04	02	3	As for Example.
6	04	18	04	0	If you would know
7	05	11	07	3	what one pound year-
8	06	04	02	2	ly Rent is worth for 7
9	06	16	00	2	years in ready money.
10	07	07	02	2	Look against Num-
11	07	17	09	0	ber 7 in the first Co-
12	08	07	08	0	lumn, and you will
13	08	17	00	2	find what 1 pound is
14	09	05	11	0	worth for seven years,
15	09	14	02	3	<i>viz.</i> 5—11—7½.
16	10	02	01	1	Now to know what
17	10	09	06	2	any other Annuity
18	10	16	06	1	(as 40 <i>l.</i> &c.) is worth
19	11	03	01	3	for the same time, for
20	11	09	04	3	say by the Rule of
21	11	15	03	1	Three.

	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>q.</i>		<i>l.</i>
If 1 <i>l.</i> be	5	11	7	3	what	40
					<i>l.</i>	<i>s.</i>
					223	5
						10

facit

I have a Shop, a Place, or an Office, &c. worth 60 pound *per annum* for 21 years, and would sell it for ready money; the question is, how much it is worth?

Look against Number 21. and you will find one pound a year is worth for that time 11 *l.* 15 *s.* 3 *d.* 1 *q.* Then say,

If 1 *l.* be worth 11—15—3 *d.* $\frac{1}{4}$ what shall 60 *l.* be?

<i>l.</i>	<i>s.</i>	<i>d.</i>
705	16	3

facit

What is 10. *l.* *per annum* worth in ready money for 4 years and $\frac{1}{2}$ to come, at 6 *l.* *per cent.*

facit 38 *l.* 7. *s.* 7. *d.* $\frac{1}{4}$

First, see the Table what 1 *l.* is worth for 4 years.

facit 3 *l.* 9 *s.* 3 *d.* $\frac{1}{2}$

Then say, if 1 *l.* be worth 3 *l.* 9 *s.* 3 *d.* $\frac{1}{2}$

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what shall 10 l. *facit* 34, l. 12 s. 11 d.
 Now to find what the $\frac{1}{2}$ years is worth, see
 in the Table what one 1 l. is worth for 5
 years. *facit* 4 l. — 4 s. — 2 d. $\frac{1}{4}$

Then say, if—1 be 4 l. 4 s. 2 d. 3 gr. 10
 From which sub- 5 years 42 l. 2 s. 3 d. $\frac{1}{2}$
 tract the 4th. year, —————
 and the remains will 4 year 34 l. 12 s. 11 d.
 be for 1 year, then —————
 take the $\frac{1}{2}$ of it, 1 year 7 l. 9 s. 4 d. $\frac{1}{2}$
 which will shew —————
 what the $\frac{1}{2}$ year is $\frac{1}{2}$ year 3 l. 14 s. 8 d. $\frac{1}{4}$
 worth, *facit*.

3 l. 14 s. 8 d. $\frac{1}{4}$, which add to the *facit* of
 the 4th. year, and it makech 38 l. 7 s. 7 d. $\frac{1}{4}$

CHAP. XVIII.

The Rule of Fellowship without time.

1. **I**N the working of this Rule there is
 no difference betwixt it and the Rule
 of Three, where every mans particular
 Stock being added together, the total must
 be the first Number in the Rule of Three,
 the gains the second, and every mans par-
 ticular Stock the third.

The

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The use of this Rule is therefore to give to each Partner his just and equal share.

Observe then,

I. *As the whole Stock is to the whole Gain, so is every mans particular Stock to every mans particular Gain.*

Example.

Two Merchants Company, A. put in 20 l.
B. put in 40 l. and they gained 50 l. I demand each mans part of the gains?

A. 20 l.

B. 40 l.

If 60 l. gain 50 l. what shall 20 l?

facit 16 l. 13 s. 4 d. A.

If 60 l. gain 50 l. what will 40 l?

facit 33 l. 6 s. 8 d. B.

50—00—00

If both the shares added together, make up the whole gains, then is the work right.

H 3

Three

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Three Farmers hired a Shepherd to keep their Sheep for 7 *l.* 10 *s.* per annum.

The first committed 430 Sheep to his care, the second 357, and the third 500 Sheep: I demand how much each man must pay of this 7 *l.* 10 *s.*

	<i>l.</i>	<i>s.</i>	<i>d.</i>	
A. must pay	2	10	1	$\frac{513}{1287}$
B. must pay	2	01	7	$\frac{387}{1287}$
C. must pay	2	18	3	$\frac{387}{1287}$

proof 7—10—0

Four Merchants ventured to Sea a Stock of 2475 pounds, whereof A. put in 710 *l.* B. put in 960 *l.* C. put in 207 *l.* D. put in 598 *l.* and they gained 2000 *l.* But Tempestuousness of Weather arising, were forced to cast over-board as many Goods as amounted to 769 *l.* I demand what each man must bear of this loss?

	<i>l.</i>	
A. must bear	220	$\frac{1498}{2475}$
B. ———	298	$\frac{698}{2475}$
C. ———	64	$\frac{783}{2475}$
D. ———	185	$\frac{1987}{2475}$

facit 769

Four

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Four Grocers laid in a Stock containing these several sums following, *A.* put in 120 *l.* *B.* put in 136 *l.* *C.* put in 180 *l.* *D.* put in 110 *l.* and with it they bought a parcel of Fruit, by which they gained 398 *l.* I demand each mans part of the gains?

$$\begin{array}{r}
 \text{Answer} \left\{ \begin{array}{l}
 A. - 73 \quad \begin{array}{l} 602 \\ 848 \end{array} \quad 602 \\
 B. - 83 \quad \begin{array}{l} 510 \\ 848 \end{array} \quad 510 \\
 C. - 110 \quad \begin{array}{l} 580 \\ 848 \end{array} \quad 580 \\
 D. - 129 \quad \begin{array}{l} 246 \\ 848 \end{array} \quad 246
 \end{array}
 \right.
 \end{array}$$

$$\begin{array}{r}
 398 \quad 19938 \quad (3 \\
 848
 \end{array}$$

Three Merchants made a Company, *A.* put in a certain sum of money, *B.* put in as oftentimes 5 *l.* as *A.* put in 4 *l.* *C.* put in as oftentimes 7 *l.* as *B.* put in 6 *l.* and they have gained together a certain sum of money, whereof *A.* his part is 100 *l.* I demand *B.* and *C.*'s part, and whole gains.

$$\begin{array}{r}
 4 - 100 - 5 \text{ facit } 125 \text{ B.} \\
 6 - 125 - 7 \text{ facit } 145\frac{1}{2} \text{ C.} \\
 \text{facit } 100 \text{ A.}
 \end{array}$$

$$\begin{array}{r}
 370\frac{1}{2} \\
 \text{Two}
 \end{array}$$

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Two Merchants made a Company, *A.* put in 350 *l.* and they gained together 196 *l.* of which *B.* must have 10 oftentimes 10 *l.*, as *A.* must have 6 *l.* I demand how much money *B.* put in the Company?

Always observe that every man must have according as he hath put in, then consider if 6 ————— 350 ————— 10

l.
facit 583 $\frac{1}{2}$ *B.* put in.

Two men Company, and make a Stock of 700 *l.* whereof *A.* put in 300 *l.* and they have gained together 240 *l.* I demand what each man must have of the gains?

facit 102 — 17 — 1 $\frac{1}{2}$ *A.*

facit 137 — 02 — 10 $\frac{2}{7}$ *B.*

240 — 00 — 00

Three Merchants made a Company, *A.* put in 600 *l.* *B.* put in 10 oftentimes 50 *s.* as *A.* put in 40 *s.* *C.* put in 10 oftentimes 70 *s.* as *B.* put in 60 *s.* and they gained together

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together 500 l. I demand what each man put in, and must have of the gains?

In question of this nature, the particular Stocks unmentioned, must be found out by that which is mentioned.

As for example, to find what Stock B. put in.

If $\frac{1}{4} \times 600 = 5$ *facit* 750 l. B.

Such reason as 6 hath to the Money which B. put in, such reason must 7 have to the money which C. put in : As,

If $\frac{1}{2} - 6 - 790 \text{ l.} - 7$
facit 875 l. C.

600 A.

750 B.

875. C.

2225

l.

1	{ 2225	-----	500	-----	600	<i>A.</i>
2	{ 2225	-----	500	-----	750	<i>B.</i>
3	{ 2225	-----	500	-----	875	<i>C.</i>

2225

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Three

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Three Merchants made a Company, *D.* put in 437 *l.* *E.* put in 211 *l.* and they have gained together 562 *l.* whereof *F.* must have 187 *l.* 15 *s.* I demand *D.* and *E.*'s part, and what *F.* put into the Company?

To find what *F.* put in, first subtract his particular from the whole gain.

$$\begin{array}{r}
 \textit{l.} \qquad \textit{s.} \\
 562 \text{ --- } 00 \\
 187 \text{ --- } 15 \\
 \hline
 374 \text{ --- } 05
 \end{array}$$

Then add *D.* and *E.*'s Stock together.

$$\begin{array}{r}
 437 \text{ D.} \\
 211 \text{ E.} \\
 \hline
 648
 \end{array}$$

Gain.		Stock.		Gain.
374 <i>l.</i> 5 <i>s.</i>	—	648	—	187 <i>l.</i> 15 <i>s.</i>
		facit		325 <i>l.</i> $\frac{615}{748}$

Then to find *D.* and *E.*'s part of the profit.

Stock.	<i>l.</i>	<i>s.</i>	Stock.
648	—	374	—
5	—	5	—
			437 <i>D.</i>
648	—	374	—
5	—	5	—
			211 <i>E.</i>

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Fellowship with time

III. The use of this part is the same with the former; and differeth not in operation, save in this, that every mans Stock is multiplied by his time, and the total of those Products added together is the first Number, the gain or loss the second Number, and every mans particular Stock and time the third.

Observe then,

IV. *As the whole Stock and Time is to the whole loss or gain :*

So is every mans particular Stock and Time to every mans particular Loss or Gain.

Example.

Two Merchants Company, D. put in 100 l. for 4 months. E. put in 136 l. for 3 months, and they gained 50 l. I demand each mans part of the gain?

	Mo.	
D. put in 100. l.	4	400
E. put in 136. l.	3	408

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$$\begin{array}{r}
 \text{l.} \\
 808 \text{ --- } 50 \text{ l. --- } 400 \text{ facit } 24 \frac{608}{808} \\
 808 \text{ --- } 50 \text{ l. --- } 408 \text{ facit } 25 \frac{808}{808} \\
 \hline
 50
 \end{array}$$

Three Butchers hired a piece of ground for 12 l. 10 s. 6 d. A. put in 20 Oxen 5 days, B. put in 16 Oxen 7 days, C. put in 25 Oxen 4 days: I demand how much each Butcher ought to pay for his proportion?

$$\begin{array}{r}
 \text{Ox. day.} \\
 \text{A. put in } 20 \text{ --- } 5 \text{ --- } 100 \\
 \text{B. put in } 16 \text{ --- } 7 \text{ --- } 112 \\
 \text{C. put in } 25 \text{ --- } 4 \text{ --- } 100 \\
 \hline
 312
 \end{array}$$

$$\begin{array}{r}
 \text{l. s. d.} \\
 312 \text{ --- } 12 \text{ --- } 10 \text{ --- } 6 \text{ --- } 100 \\
 \text{l. s. d.} \\
 \text{facit } 4 \text{ --- } 0 \text{ --- } 3 \frac{6}{12} \\
 312 \text{ --- } 12 \text{ --- } 10 \text{ --- } 6 \text{ --- } 112 \\
 \text{facit } 4 \text{ --- } 9 \text{ --- } 11 \frac{4}{12} \\
 312 \text{ --- } 11 \text{ --- } 10 \text{ --- } 6 \text{ --- } 100 \\
 \text{facit } 4 \text{ --- } 0 \text{ --- } 3 \frac{9}{12}
 \end{array}$$

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	<i>l.</i>	<i>s.</i>	<i>d.</i>
A.	4—	0—	3 $\frac{6}{13}$
B.	4—	9—	11 $\frac{1}{13}$
C.	4—	0—	3 $\frac{6}{13}$

proof 12—10—6 $\times 3$ (1
 $\times 3$

Three Merchants Company, *A.* put in the first of *January*, 120 *l.* until *March* the 22. *B.* put in 176 *l.* the 10 of *Feb.* until the 12 of *April.* *C.* put in 295 *l.* 2 of *Feb.* until the 25 of *April*, and they gained 800 *l.* I demand each mans part of the gains?

l.
A. must have 174 $\frac{7596}{44648}$

B. must have 192 $\frac{16768}{44648}$

C. must have 433 $\frac{20181}{44648}$

proof 800

44648 (1
 44648

Three

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Three Merchants Company for 18 Mo.
 D. put in 500 *l.* and at 5 Mo. took out
 200 *l.* and at 10 Mo. put in more 300 *l.* and
 at 14 Mo. took out 130 *l.* E. put in 400 *l.*
 and at 3 Mo. put in more 270 *l.* and at 9.
 Mo. took out 100. and at 12 Mo. put in
 more 100 *l.* and at 15 Mo. took 99 *l.* F.
 put in 900 *l.* and at 6 Mo. took out 200 *l.*
 and at 11 Mo. put in 500 *l.* at 13 Mo. took
 out 600 *l.* and they gained 200 *l.* I de-
 mand each mans part of the gains?

D. must have 50 $\frac{12350}{32873}$
 E. must have 62 $\frac{20447}{32873}$
 F. must have 87 $\frac{49}{32873}$

proof 200

32873 (1
 32873

Two men made a Stock of 165 pound
 wherewith they gained 28 pound, which
 added to the Stock makes 193 pound.
 D. his Money was in 12 months, and E.
 his Money was in but 8 mo. When they
 shared the stock and gain, D. had 67 *l.*
 and E. 126 *l.* I demand what was each
 mans Stock?

State

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State your question thus :

As 12 mo. to 165 *l.* so is 8 mo. to 110. *l.*
for E's stock, the which subtract from 165,
and the remainder will be 55 *l.* for D's
stock.

The Proof.

If 55 *l.* in 12 mo. gain 12 *l.* what 100 *l.*
in 8 months? gains.

55 *l.* — 12 *l.* — 110 *l.* *facit* E. 16 *l.*
mo. 12. 8 mo. *facit* D. 12 *l.*

Or,

Having the stock you have the gains, by
subtracting each mans stock from his stock
and gain, given without the Rule of Three.

Stock and gain of D. 67 *l.*

Stock of D. 55

D. his gain 12

Stock and gain of E. 126

Stock of F. — 110

E. his gain 16

So that D. with 55 *l.* Stock gains 12 *l.*
E. with 110 *l.* gains 16 *l.*

12

28

CHAP.

CHAP. XIX.

Of Barter.

Barter is the exchanging Wares for Wares, for one Commodity for another.

Example.

Two Merchants Barter : *A.* hath 3 C. $\frac{1}{2}$ of Pepper at 13 *d.* $\frac{1}{2}$ per pound ; *B.* hath Ginger at 15 *d.* $\frac{1}{4}$ per pound. I demand how much Ginger must be delivered for the Pepper ?

1. See what the Pepper is worth, saying,
If 1 lb. cost 13 *d.* $\frac{1}{2}$, what cost 3 lb. $\frac{1}{2}$?
facit 22 *l.* 1 *s.*

2. Say, if 15 *d.* $\frac{1}{4}$ buy 2 lb of Ginger, what will 22 *l.* 1 *s.* buy ?

facit 347 $\frac{1}{2}$ Ginger.

Two men Barter : *A.* hath 20 Ells of Cloath at 9 *s.* 6 *d.* per Ell ready mony, but in Barter he will have 10 *s.* 2 *d.* per Ell : *B.* hath *Jersey* Wooll at 2 *s.* 10 *d.* per pound. I demand how much Wooll must be delivered for the Cloath in Barter ?

As

As before, so here,

If 1 Ell of Barter be 10 s. 2 d. what 20 Ells in Barter?

facit 2440 d.

If 34 d. buy 1 lb. what will 2440 d. buy?

facit 71 lb. $\frac{13}{17}$

Two Drapers Barter, the one hath 472 yards of Canvas at 16 d. per yard; the other lets him have 38 pieces of Cloath: the question is, how much one Cloath stands him in?

facit 16 s. $\frac{1}{2}$

20 Bags of Hops, each 3 C. $\frac{1}{2}$, Bartered for 336 C. of Brazil, at 18 s. a C. I demand what price were the Hops sold at?

Answer 4 l. 6 s. $\frac{14}{33}$ per C.

A Merchant hath Tobacco, which he will Barter at 14 d. per lb. for Sugar at 10 d. per pound in Barter. I demand how much Tobacco must be given for 8900 lb. of Sugar?

Answer 6357 lb. $\frac{1}{7}$

Nutmegs

Nutmegs at 4 s. 2 d. per lb. ready money, 5 s. in Barter, how must Pepper at 12 d. per lb. be sold to make the like profit?

Answer 14 d. $\frac{2}{3}$

How many dozen of Candles at 5 s. 2 d. per dozen must be given for 3 C. 2 qrs. 16 l. of Tallow, at 37 s. 4 d. per C.

Answer 26 dozen $\frac{3}{11}$

A Merchant hath Stockings at 39 s. per dozen ready Money, which he will Barter at 46 s. per dozen for Canvas, at 13 d. $\frac{1}{2}$ per Ell ready money. I demand what price the Canvas must bear in Barter, to gain 5 l. in the 100 l.

Answer 16 d. $\frac{1}{2}$ and $\frac{57}{100}$ of $\frac{1}{2}$ d.

Broad Cloath of 6 s. 8 d. the yard ready money is Bartered at 7 s. 9 d. for Wooll at 10 d. per l. ready money: What price must be made of the Wooll in Barter to gain 11 l. per cent.

Answer 12 d. $\frac{723}{1000}$

D. hath Holland of 5 s. per Ell ready money. Bartered at 6 s. per Ell to E. for broad-Cloath, at 9 s. 6 d. per yard, which cost
but

but 8 s. I demand which gaineth most, and how much *per cent.*

Answer D. gains 20 l. *per cent.*

E. 18 l. 15 s. *per cent.*

CHAP. XX.

Of Equation.

THE Rule of Equation of Payments teacheth to reduce the times of several particular payments, to one time for the payment of the whole sum.

Example.

If the question be of this Nature.

A Merchant oweth 500 l. to be paid at 3 payments, *viz.* 300 l. at 4 months, 100 l. at 6 mo. and 100 l. at 12 mo. The Debtor agrees to discharge the whole Debt at one payment. Now the question is, at what time the payment ought to be made, without damage unto the Debtor or
Cre-

Creditor, accounting 6 l. per cent. per annum
Interest.

The Rule is this.

II. Multiply each particular payment by its time, then add all the Products together, and divide the total by the whole Debt.

<i>l.</i>		<i>Mo.</i>	
300	multiplied by	4	<i>facit</i> 1200
100	multiplied by	6	<i>facit</i> 0600
100	multiplied by	12	<i>facit</i> 1200
<hr/>		<hr/>	
<i>Divisor</i> 500		<i>Dividend</i> 3000	
		3.000	(6
		5.00	

So that the Answer to the question (according to this Rule) is, that six months is the time for the payment of the whole sum.

III. *For the proof of this Rule, thus :*

300. *l.* ought to be paid at 4 months, and is not paid till 6 months, that is 2 months after its time. The Interest of 300 *l.* for 2 months is 3 *l.*

Then 100 *l.* paid at 6 months, is the time Equated.

The other 100 *l.* to be paid at 12 mo. is paid 6 months before its time; and the Interest thereof for 6 months, is likewise 3 pound.

Which sheweth the Rule to be true, and at 6 months is the time for the payment of the whole sum, and thereby neither the Debtor nor Creditor is damaged according to the Law.

A Merchant oweth 450 *l.* to be paid at 3 payments $\frac{1}{3}$ at 3 months, $\frac{1}{3}$ at 5 mo. and $\frac{1}{3}$ at 8 mo. and the Debtor and Creditor agree, that the whole sum shall be paid at one time : The question is, what time ought the whole sum to be paid in; so that neither the one nor the other may be damaged.

The

The Rule is to multiply each part by its time, thus :

$$\begin{array}{r}
 3 \\
 \hline
 \frac{1}{3} \text{ by } \frac{1}{3} \text{ facit } 1 \text{ mon.} \\
 \hline
 3 \\
 5 \\
 \hline
 \frac{1}{3} \text{ by } \frac{5}{3} \text{ facit } 1 \text{ mon. } \frac{2}{3} \\
 \hline
 3 \\
 8 \\
 \hline
 \frac{1}{3} \text{ by } \frac{1}{3} \text{ facit } 2 \text{ mon. } \frac{2}{3} \\
 \hline
 3 \\
 \hline
 \text{facit } 5 \text{ mon. } \frac{1}{3}
 \end{array}$$

A Merchant oweth 300 £ to be paid $\frac{1}{3}$ at 3 months, $\frac{1}{3}$ at 6 months, and $\frac{1}{3}$ at 12 mo. I demand at what time the said sum ought to be paid together ?

$\begin{array}{r} 3 \\ \hline \end{array}$	Months	<p>To prove the certainty of this manner of operation you may take the same course as before, 7 months being the time for payment of the whole sum.</p>
$\frac{1}{3} \text{ by } \frac{3}{1} \text{ facit } 1.$		
$\begin{array}{r} 3 \\ 6 \\ \hline \end{array}$		
$\frac{1}{3} \text{ by } \frac{6}{1} \text{ facit } 2.$		
$\begin{array}{r} 3 \\ 12 \\ \hline \end{array}$		
$\frac{1}{3} \text{ by } \frac{12}{1} \text{ facit } 4.$		
$\begin{array}{r} 3 \\ \hline \end{array}$		
$\text{facit } 7 \text{ mo.}$		

See first what the Interest of the money comes to, that should have been paid before the 7 months: and then see what the Interest of the money comes to, that should have been paid after the 7 months: and if the Interest of the one part be equal with the Interest of the other, then is the former operation right; and 7 months must needs be the just time. As for Example.

100 *l.* should have been paid at 3 months, but now is not paid till 7 months

mo. so that the Interest for that 100 *l.* must be accounted for the 4 months delay, which Interest is — 2 *l.* — — — — 00 *s.*

100 *l.* more should have been paid at 6 mo. and now is delayed till 7 mo. The Interest for that is — — — — 0 — — — — 10

facit 2 — — — — 10

The other 100 *l.* is paid 5 mo. before its time, and the Interest thereof for 5 mo. is likewise — 2 *l.* — — — — 10 *s.* equal with the former, which shews the operation to be right.

There is owing to a Merchant 340 *l.* to be paid 80 pound ready money, 100 *l.* at 3 mo. and 160 *l.* at 8 mo. I demand what is the indifferent time for the payment of the whole?

IV. In Questions of this nature, set down the particular sums, and the several times of payment, thus:

<i>l.</i>	mo.
80 — — —	00
100 — — —	03
160 — — —	08

Then Multiply each Sum by its time of payment, and the work will stand

stand thus. Add all the Products together,
and divide the total by the whole debt.

l.	Mo.
8 0—0— 00	0
10 0—0— 30	0
16 0—0— 123	0

34 Divisor 158 Dividend.

(2 (2

$\times 58$ (4 $\frac{11}{17}$ facit.

34

There is 245 l. 10 s. 9 d. to be paid $\frac{1}{2}$ at 6 mon. $\frac{1}{3}$ at 8 mo. and the rest at 12 mon. what is the indifferent time for the payment of the whole sum together?

This Rule is laid down in the first and second Examples, multiply each part by its time.

by 6 facit—3 (The certainty here-
by 8 facit—2 of is demonstrated by
by 12 facit—2 } the proof of the third
Example.

facit Mo. 7 $\frac{2}{3}$.

A. is indebted unto B. 300 l. to be paid 100 l. at 4 mon. and 200 at 8 mon.

I

And

And B. oweth unto A 500 *l.* to be paid at 10 months. It is agreed between them A. shall make present pay for his whole Debr, and B. shall pay his so much the sooner, as shall countervail that favour: I demand at what time B. must pay the 500 *l.* reckoning simple Interest?

V. For the resolution of this, and the like Questions, first see by the former Rule what time A. ought to pay in his whole money.

	Mo.	
1 00 ———	at 4 ———	4
2 00 ———	at 8 ———	16
<div style="text-align: right;"> (2 20 (6 $\frac{2}{3}$ 3 </div>		

Then say by the Rule of Three.

If 3 ——— 6 $\frac{2}{3}$ ——— 5
 20 (4 mo. *facit.*
 5

Which 4 months is to be subtracted from 10 months, (the time that B. ought to have paid in his money) and there remaineth 6 months.

Observe,

Observe, For the proof hereof see first what the Interest of 300 *l.* comes to for 6 months $\frac{2}{3}$.

Then see what the Interest of 500 *l.* comes to for 4 mon. If both the Sums be alike, then is the former work true.

A Merchant hath a certain sum of money owing to him, to be paid at 7 months, his Debtor doth agree to pay him $\frac{1}{2}$ ready money, and $\frac{1}{3}$ at 4 months: I demand what time he must have to pay in the rest, so that neither party may have advantage of the other without reckoning Interest upon Interest?

VI. For the Resolution hereof, it matters not what the sum was, but you may work the same by any number that will easily admit of the parts mentioned in the Question. And for our present use, we will imagine the sum that was to be paid at 7 mon. 60 *l.*

Whereof $\frac{1}{2}$ that is 30 *l.* must be paid content.

And $\frac{1}{3}$ which is 20 *l.* must be paid at 4 months; then see what the Interest of these two parts comes to, for the time in which they were paid before they were due.

The Interest for 30 *l.* for 7 months is

—21 *s.*

The Interest for 20 *l.* for 3 months is

—06 *s.*

facit 27 *s.*

Now that which remains for a full Resolution of the question is only this :

To find out how long time the remaining part of the Sum (which is 10 *l.*) must be retained, that the Interest thereof may come to 27 *s.*

And that is done by the Rule of Three, thus :

The Interest for 10 *l.* for 1 mo. is 1 *s.*

If ——— 1 *s.* ——— 1 mo. ——— 27 *s.*

Unto which add the *facit* 27 mo.
7 mo. allowed at first. 07

facit 34 mo.

A Merchant hath owing him 500 *l.* to be paid him at 8 mo. and his Debtor doth agree to pay him 200 *l.* at 3. mo. on condition that he shall let him have the rest for so much the longer : The question is, when he must pay the rest—with Interest upon Interest.

As in the former question, so in this:
First, see what the Interest of 200 *l.* comes
to for 5 months, paid before the time.

The Interest of 200 *l.* for 5 mo. comes
to — 5 *l.* — 00 *s.* — 00 *d.*

Then by the Rule of Three, see how ma-
ny months 300 *l.* — 00 *s.* — 00 *d.* must be
let out, that is the Interest thereof may
come to 5 *l.*

facit 3 mo. $\frac{1}{3}$

To which add the 8

facit 11 $\frac{1}{3}$

A Merchant hath owing to him 145 *l.*
10 *s.* 9 *d.* to be paid $\frac{1}{3}$ content, $\frac{1}{4}$ at 3 mo;
 $\frac{1}{4}$ at 5 mo. and the rest at 7. mo. And his
Debtor doth agree to pay him all at one
payment. I demand when that payment
must be made, that neither have advantage
of the other?

	mo.	mo.
$\frac{1}{3}$ at	— 0 — 0	0
$\frac{1}{4}$ at	— 3 — 0	$\frac{3}{4}$
$\frac{1}{4}$ at	— 5 — 1	1
$\frac{1}{6}$ at	— 7 — 1	$\frac{1}{6}$

facit 3 mo. $\frac{4}{13}$
1 $\frac{3}{13}$

A

A Merchant hath owing 243 *l.* 19 *s.* 11 *d.* to be paid $\frac{1}{2}$ at 2 months, $\frac{1}{3}$ at 3 months, and the rest at 6 months: the Debtor doth agree to pay $\frac{1}{2}$ content, and the other half at one payment. I demand when the payment must be made, that neither may be damnified?

First, Do according to the former Rule, what is the indifferent time for the payment of the whole sum together?

$$\begin{array}{rcl}
 \frac{1}{2} & \text{at} & 2 \text{ --- } 0 \frac{1}{2} \\
 \frac{1}{3} & \text{at} & 3 \text{ --- } 1 \\
 \frac{1}{6} & \text{at} & 6 \text{ --- } 3 \\
 \hline
 \end{array}$$

facit 4 $\frac{1}{3}$ mo.

Now in regard that $\frac{1}{2}$ is paid in 4 mon. and $\frac{1}{3}$ before it is due, it is Reason, and according to Rule, that he should have the other $\frac{1}{3}$ 4 mo. $\frac{1}{3}$ longer, which being added to the just time of the payment,

facit 8 mo. $\frac{1}{3}$

C H A P. XXI.

The Rule of Rebate or Discount.

1. **M**erchants commonly vend their Commodities either for ready money, or to be paid at a certain time or times appointed, at 3, 4, 6, 12 months, or the like: but it often happeneth to be very convenient both to the buyer and seller, that this money be paid in before it be due.

A Merchant sells Goods to the value of 100 *l.* to another, to be paid at 12 months, but the other is willing upon an after-agreement to pay present money upon Rebate, after 6 pound *per cent. per annum*, simple Interest. I demand the sum paid and rebated?

Observ. Before you lay down the manner of working, observe, that in all Rebate-ments, there ought to be no more money paid than would augment it self to the sum first due, if it were put forth to Interest, and this may also serve as a sure proof of this Rule.

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How to State the Question.

1. First, see what the Interest of 100 £. cometh to for the time demanded.
2. Add that Interest to the 100 £. which must be the first number in the Question 100 £. the second, and the Sum to be reba- ted the third.

Example.

$\frac{1}{106} - \frac{1}{100} - \frac{1}{100}$
 $\frac{1}{100}$

$\begin{array}{r} 1000000 \\ \times 94\frac{1}{2} \\ \hline 4000000 \\ 10000000 \\ 100000000 \\ \hline 94500000 \end{array}$

I demand how much the rebate of 289 £ . 19 s . will amount unto for 6 months, after 8 $\text{per cent. per annum}$, simple Interest?

$$104 \text{ --- } 100 \text{ --- } \overset{l.}{289} \text{ --- } \overset{s.}{19}$$

$$\begin{array}{r} 5799 \\ 100 \\ \hline 579900 \end{array}$$

(1

76(0

5992(0

579900(55715

x04444

x0000 278—15— $\frac{25}{8}$

xx

l.

s.

d.

was to be paid 289—19—0

Is to be paid 278—15— $\frac{25}{8}$ Is rebated — 11 — 3 — $\frac{1}{8}$

I demand the Rebate of 321 l. 18 s. for 11 months, after 6 pound per cent. per annum, simple Interest.

To find the Interest of 100 l. for any number of mo. you may take the parts of 12 months, as thus: If 6 l. be the Interest of 100 l. for 12. mo. then 6 mo. will be the $\frac{1}{2}$ of that; 3 mo. the $\frac{1}{4}$ of that $\frac{1}{2}$, and 2 mo. the $\frac{1}{3}$ of that for 6 months.

Example.

mo. l.

12—6

6—3

3—1 10

2—1

5 l. 10 s.

105—10 s.—100 l.—321 l. 18 s.

facit 305 l.— $\frac{25}{8}$

I 5

I de-

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I demand the discount of 378 pound for two 6 months, after 6 pound per cent. per annum, simple Interest?

By two 6 mo is under- } mo. l.
stood that the one $\frac{1}{2}$ of the } 12—6—378
money is to be paid at 6 }
mon. and the other $\frac{1}{2}$ at 6 } 6—3—189
mo. after that }

l.	l.	l.
103—	100—	189
		<i>facit</i> 183 l. $\frac{11}{100}$

l.	l.	l.
106—	100—	189
		<i>facit</i> 178 l. $\frac{16}{100}$

I demand the Discount of 760 l. 16 s. for three 4 months, after 6 pound per cent. per annum simple Interest?

mo.	l.	l.	s.
12—	6	$\frac{1}{3}$	760—16
4—	2		253—12
8—	4		253—12
12—	6		253—12

102—	100—	253 l.—12 s.
		<i>facit</i> 248 l. $\frac{32}{100}$ for the first payment at 4 (months,

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104 l. — 100 — 253 l. — 12 s.
facit 243 l. $\frac{11}{12}$ for the second payment
 (at 8 months.

106 l. — 100 — 253 — 12 s.
facit 239 l. $\frac{13}{12}$ for the third payment
 (at 12 months.

There are other ways for the working of
 Rebate, but I shall only instance one more
 after 6 l. per cent.

As first multiply the money and the time.

*Secondly, Divide that Product by 200, and
 the Time, and the Quotient is the sum to be
 paid upon Rebate. Example.*

What is the Rebate of 100 l. for 12 mo.
 after 6 l. per cent. per annum?

$$\begin{array}{r}
 100 \\
 12 \\
 \hline
 1200 \\
 614 \\
 \times 88 \quad 05 \quad \begin{smallmatrix} 140 & 120 & 35 \\ 212 & 100 & 55 \end{smallmatrix} \\
 \hline
 212
 \end{array}$$

100 was to be paid.

5 $\frac{35}{100}$ is to be Rebated.

l. 94 $\frac{18}{100}$ is to be paid.

And thus you may work any other que-
 stion after 6 per cent. &c.

But if the Rebate be after 8 l. per cent.
 then let the Diviser be 150 and the time.

CHAP. XXII.

Of Exchange.

1. **T**H E whole course of Exchange is no more than to pay money in one Place or Country, and receive in another the like value or sum, with consideration of either loss or gain.

I might give you a Catalogue of Foreign Coins, but it will be to little purpose, because they are not current money as our *English* is, but do rise sometimes higher in value, and sometimes lower according as the Exchange runs. I shall therefore give you some choice Questions, and so leave you to enlarge as you see occasion.

A Merchant delivered 340 *l. Sterling* at *London* to receive the same at *Amsterdam*, the Exchange at 34 *s. 7 d. Flemish*, the 20 *s. Sterling*, I demand the same in *Flemish* money.

2. Consider that first and third numbers must be of one kind; if the first be *Sterling* money, the third must be so too: if the first *Flemish*, the third must be *Flemish*.

IF

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Of Exchange

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<i>s. ft.</i>	<i>s.</i>	<i>d. Fl.</i>	<i>l. ft.</i>
If 20—	34—	7—	340
	12		20

415
6800

6800

332000
2490

282200|0

$\frac{1}{12}$ 141100 *d.*

1175|8—4 *d.*

facit 587—18—4

Or thus.

340 *l.*—at 34 *s.*—7 *d.*

34

1360
1020

170

28—4 *d.*

1175|8—4 *d.*

587—18—4 *facit*

A Mer-

A Merchant received a Bill of Exchange of 8000 Crowns at $5\ s. \frac{5}{7}$ *Sterl.* I demand the sum in *Sterling* money. Say,

If 1 be— $5\ s. \frac{5}{7}$, what—8000?

facit 2285 *l.* 14 *s.* 3 *d.* $\frac{5}{7}$

A Merchant delivered 245 *l. Flem.* at *Middleborough* to receive the same at *London*, the Exchange at 29 *s.* and 5 *d. Flem.* the 20 *s. Sterl.* I demand the Sum *Sterling* money.

If 29 *s.* 5 *d. Flem.* be 20 *s. Sterl.* what 245 *l. Flem.*

facit 166 *l.* 11 *s.* $\frac{157}{553}$

A Merchant of *London* receiveth a Bill of Exchange from *Paris* 460 *l. Sterling*, for the value delivered there at 84 *d. Sterling*, the 60 *s. Tournois.* I demand how much was delivered at *Paris* *Tournois*, when 20 *s.* makes one pound *Tournois*?

84 *d.*—60 *s.*—460 *l.*

facit 3942 *l.* 17 *s.* $\frac{1}{7}$ *Tournois.*

A Merchant at *London* delivered 80 *l. Sterling* by Exchange for *Frankford* at 4 *d. Sterling* the Florine of 67 *Kreutzers.* The question is, how many Florines of 63 *Kreutzers* the Florine, he must receive at *Frankford*?

$$\begin{array}{r}
 (4 \\
 67 \text{ (I } \frac{4}{83} \\
 63 \\
 40 \text{ ——— I } \frac{4}{83} \text{ ——— } 80 \text{ l.} \\
 \text{facit } 510 \frac{1}{31}
 \end{array}$$

A Merchant at *Dantzick* doth receive a Bill of Exchange from *London* 3999 Florins, and is for 376 *l. Sterling* delivered at *London*. I demand at what price the pound *Sterling* was delivered, when 30 gros *Polish* make a Florine?

facit 319 $\frac{11}{188}$ gros *Polish*.

At *Antwerp* a Merchant receiveth a Bill of Exchange from *London* of 375 *l. Flem.* for the value received there at 27 *s. 5 d. Flem.* the 20 *s. Sterling*. I demand the sum in *Sterling* money that was delivered at *London*?

facit 273 *l. 11 s. 37 $\frac{1}{2}$*

A Merchant at *London* doth deliver 370 *l. Sterling* by Exchange for *Roan* at 73 *d. Sterling* for 50 *s. Tournois*. The demand is, how much he must receive at *Roan* *Tournois*?

facit 60821 *s. 67 $\frac{2}{3}$ Tournois*.

A Span-

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A *Spanish* Merchant doth receive a Bill of Exchange from *London* of 700 Duckets, and is for 196 *l.*—15 *s.* delivered at *London*. I demand at what price the Ducket was delivered?

facit 5 *s.* $\frac{87}{140}$

III. *How to know at what rate we make the Exchange, transporting Money or Wares from one Country to another.*

If a Ducket of *Venice* be worth 120 *s.* and at *London* 5 *s.* 7 *d.* At what price is the Exchange made for the Ducket of 112 *s.* in transporting from *Venice*?

120 ————— 5 *s.* ————— 7 *d.* ————— 112
facit 5 *s.* 2 *d.* $\frac{8}{12}$

If a *French* Crown at *Hamborough* be worth 45 *s.* *Lubish*, and an Angel be worth 78 *s.*, and at *London* a *French* Crown is worth 6 *s.* *Sterling*, and the Angel 11 *s.* *Sterling*. Whether is it better to bring Angels or *French* Crowns from *Hamborough* to *London*?

It is better to bring *French* Crowns by

$\frac{27}{78}$
If a piece of *Searge* be worth 28 *s.* *Sterling*, and at *Frankford* it is worth (all charges

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charges abated) 17 Florines at 60 *Kreutzers* the Florine, at what price do I make the Exchange for 66 *Kreutzers* in carrying Searges from *London* to *Frankford*?

facit 1 s $\frac{207}{235}$

If a Mark at *Hamborough* be worth 33 s. Lubish, and at *London* 13 s. 7. d, at what price is the Exchange made for one pound Sterling in bringing Marks from *Hamborough* to *London*?

facit 184 s. $\frac{8}{43}$ Lubish.

If a *French Crown* be worth 7 s. $\frac{3}{4}$ Flem. at *Antwerp*, and 6 s. at *London*, at what price do I make the Exchange for one pound Sterling in bringing *French Crowns* from *Antwerp* to *London*?

facit 25 s. $\frac{1}{3}$ Flemish

If a Dollar at *Dantzick* be worth 39 Gros, and at *London* 4 s. 8 d. at what price do I make the Exchange for one pound Sterling, transporting Dollars from thence to *London*?

facit 167 $\frac{8}{36}$ Gros.

CHAP.

CHAP. XXIII.

Of Loss and Gain.

I Need not go about to acquaint you with the meaning of this Rule, because the words themselves are sufficient to inform you. And for its nature, I shall shew it you by many and various Questions, which indeed are something hard to apprehend, without the well minding of these four principal Heads, which being well understood, will carry you through the difficulties thereof.

As,

First, To know what is gained or lost *per cent.*

Secondly, To know how it shall be fold for to gain or lose so much *per cent.*

Thirdly, Having gained or lost so much *per cent.* to know what it cost.

Fourthly, There being so much gained *per cent.* when fold for such a rate : To know what is gained *per cent.* when fold for more, or what is lost *per cent.* when fold for less.

Of

Of these in order.

First, To know what is gained or lost per cent. per Pound, per Ell, per Yard, &c.

Example.

If 1 lb. of Tobacco cost 18 d. and is sold for 21 d. I demand how much is gained per cent? *First, see what the Gain or Loss is by Subtraction*

$$\begin{array}{r} 21 \\ 18 \\ \hline \end{array}$$

Then let the price it cost be the first number in the Rule of Three, the Gain or Loss the second, and 100 l. the third.

18 gain—3 d.—What 100?
facit 16 l. 13 s. 4 d.

If a Leather-feller buy a parcel of Leather for 2 s. 10 d. per Skin, and selleth the same again for 3 s. 2 d. what doth he gain per cent.

3 s. 2 d. If 34 d. gain 4 d. what 100 l.
2 ——— 10 facit 11 l. 15 s. 3 d. $\frac{2}{17}$

3 ——— 4

If

If I buy an Ell of Holland for 6 s. 7 d. and sell it again for 5 s. 9 d. I demand how much the loss is *per cent*?

$$\begin{array}{r}
 \text{s.} \quad \text{d.} \\
 6 \text{ --- } 7 \\
 5 \text{ --- } 9 \\
 \hline
 \hline
 \text{--- } 10
 \end{array}$$

If 6 s. 7 d. ——— 10 d. ——— 100 l

facit 12 l. 13 s. 01 d. $\frac{2}{3}$

If 1 lb. cost 10 d. and is sold again for 8 d. the question is, what is lost *per cent*?

If 10 d. lost ——— 2 d. what 100 l.
facit 20 l.

If a piece of Cloth containing 24 Yards, cost 42 s. and one Yard is sold for 2 s. 8 d. the question is how much is gained or lost *per cent*?

Gained 52 l. 7 s. 7 d. $\frac{1}{4}$ *per cent*.

If a piece of Silk contain 36 Yards cost 9 l. and one Yard is sold for 9 s. 8 d. I demand whether I win or lose, and how much *per cent*.

facit 93 l. — 9 s. — 8 d. gain.

A Draper hath a piece of Cloth containing 30 Yards, cost him 14 s. the Yard, and another Cloth containing 19 Yards, cost 7 s. the Yard, and he sells them one with another for 13 s. the Yard; I demand whether he

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he doth win or lose, and how much *per cent*?

—1 $\frac{5}{7}$ *facit* gains *per Yard*.
facit 15 l.—03 s. 9 d. $\frac{315}{33}$ gains in Ell.

If one Yard cost 3 s. ready mony, and is fold again for 3 shil. 4 d. for 8. mon. I demand how much is gained *per cent. per annum*, without Interest upon Interest?

facit 16 l.—13 s. 4 d. gains.

If one Yard cost 9 s ready mony, and is fold for 8 s. the Yard, for 16 months, the question is, how much is lost *per cent. per annum*, without loss upon loss?

facit 11 l. 2 s.— $\frac{2}{9}$ for 16 months.
 Lost 8 l.—6 s.— $\frac{1}{3}$ for 12 months.

If I buy Cloth for 6 s. a Yard for 8 mon. and sell the same again for 5 s. 6 d. ready mony, how much do I lose *per cent, per annum*?

Questions of this nature are to be resolved at two workings by the Rule of Three, thus?

If 6 s. lose——6 d.——what 100 l.
facit 2000 d

If 8 mo. lose 2000 d.——what 12 mo.
facit 12 l. 10 s.

If

If I buy Cottons for 3 s. a yard for 5 months, and sell them again for 3 s. 2 d. ready money: The question is, how much I gain *per cent.* allowing 6 *per cent.* Interest?

First, See what they cost in ready money.

Thus:

$$102 \text{ l.} \text{ --- } 10 \text{ s.} \text{ --- } 100 \text{ l.} \text{ --- } 3 \text{ s.} \\ \text{facit } 2 \text{ s. } 11 \text{ d. } \frac{5}{41}$$

$$2 \text{ s.} \text{ --- } 11 \text{ d. } \frac{5}{41} \text{ --- } 2 \text{ d. } \frac{36}{41} \text{ --- } 100 \text{ l.} \\ \text{facit } 8 \text{ l. } 3 \text{ s. } 10 \text{ d. } \frac{2}{3} \text{ gain per cent.}$$

A Grocer doth sell Cloves for 4 s. *per* pound ready money: The question is, how long time he must demand, when he doth buy the same Cloves at 3 s. 8 d. the pound, to gain 13 l. *per cent. per annum*, without gain upon gain, at 6 *per cent.* Interest.

First, See what the gain is, if bought at 3 s. 8 d.

Thus:

$$3 \text{ s.} \text{ --- } 8 \text{ d.} \text{ --- } 4 \text{ s.} \text{ --- } 100 \text{ l.} \\ \text{facit } 109 \frac{1}{11}$$

Here is gained but 9 l. $\frac{1}{11}$, but he must gain 13 l. that is 3 l. $\frac{10}{11}$ more, which must be gained by time: Therefore say,

$$\text{If } 6 \text{ l.} \text{ --- } 12 \text{ mo.} \text{ --- } 3 \text{ l. } \frac{10}{11} \\ \text{facit } 7 \text{ mo. } \frac{2}{11} \\ \text{A Lin-}$$

A Linnen Draper hath several sorts of Cloath, viz. 470 Ells at 2 s. 10 d. per Ell ready money, 730 Ells at 2 s. 6 d. per Ell ready money, and 179 Ells at 3 s. 10 d. per Ell ready money, and he sells the Ell one with another for 2 s. 2 d. to be paid $\frac{1}{2}$ at 5 mo. $\frac{1}{4}$ at 6 mo. and the rest at 9 mo. Interest at 6 l. per cent. I demand what is lost per cent.

Ells.	s.	d.	l.	s.	d.
470—at 2	—	10	is—66	—	11—8
730—at 2	—	6	is—91	—	05—0
179—at 3	—	10	is—34	—	06—2
<hr/>					
1379 Ells cost	—	—	192	—	02—10

1379 Ells sold at 2 s. 2 d. is 149 l. 7 s. 10 d.

Which sum being to be received as above said, will by Rebate at 6 l. per cent. come to no more than 144 l. 17 s. 4 d. Then say,

If 192 l. 2 s. 10 d.—100 l. 144 l. 17 s. 4 d.
facit 24 l. 12 s. per cent. lost.

The second Head.

To know how a Commodity must be sold to gain or lose so much per cent.

Example.

If one pound of Nutmegs cost 9 s. 2 d. how much must it be sold for to gain 6 l. per cent.

Let

Let 100 l. be the first number in the Rule of Three, the price the second, and 100 l. with the profit added, or the loss subtracted, the third Number.

If 100 l. be 9 s. 2 d. price, what 106 l.
facit 9 s. 8 d. $\frac{2}{3}$

If a Barrel of Gun-powder cost 3 l. how must it be sold to lose 9 l. per cent?

If 100 ——— 3 l. ——— what 91 l.
facit 2 l. 14 s. 7 d. $\frac{1}{2}$

If one Gallon of Sack cost 5 s. 10 d. for how much must it be sold for to lose 8 l. per cent.

If 100 l. ——— 05 ——— 10 d. ——— 92 d.

It must be sold for 5 s. 4 d. $\frac{2}{3}$

If 90 Ells of Cambrick cost 60 l. for how much must one yard be sold to gain 18 l. per cent.

It must be sold for 12 s. 7 d. $\frac{21}{25}$

If a Bag of Hops, weight 16 C. 1 qr. 12 lb. cost 27 l. 6 s. 8 d. for how much must the C. weight be sold to lose 8 l. per cent.

facit cost per C. 1 l. 13 s. 3 d. $\frac{11}{15}$

Sold to loss per C. 1 l. 10 s. 8 d. $\frac{11}{11+5}$

A Sugar Baker hath 736 pound of Sugar that cost 13 d. a pound, and 137 lb. 12 d. a pound; I demand how he must sell the

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the pound one with another to gain 9 *l. per cent.* First see what one pound cost

facit 12 *d.* $\frac{736}{275}$

It must be sold for, to gain 9 *l. per cent.*

1 *s.* 1 *d.* $\frac{21892}{275}$

If a pound of Mace cost 8 *s.* how must it be sold to gain 24 *l. per cent.*

facit 9 *s.* $\frac{23}{25}$

If 5 yards cost 5 *l.* ready money, for how long time must it be sold for 95 *s.* to lose 20 *per cent.* without loss upon loss?

If I lay out 100 *l.* ready money, and must receive but 95 *l.* there is 5 *per cent.* loss; but I must lose 20 *l. per cent.* that is, 15 *l.* more, so that I must sell my Goods, as if I sold that which cost me 100 *l.* for 80 *l.* Therefore see in what time 80 *l.* will amount to 95 *l.* at 6 *per cent* and that will answer the question.

If 100 *l.* lose 6 *l.* in 12 months, in what time shall 95 *l.* lose 15 *l.*?

Or thus:

If 100 *l.* ————— 6 *l.* ————— 80 *l.*

facit 4 *l.* 16 *s.*

4 *l.* ————— 16 *s.* ————— 12 ————— 15 *l.*

K

IF

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If one pound cost 23 *d.* ready money, for how long time must it be sold for 25 *d.* to gain 11 per cent. per annum at 6 l. per cent.

Suppose I sell for 12 mon. time, then I gain in the price 8 l. $\frac{16}{23}$.

As thus:

$$\begin{array}{rcl} \text{If } 23 \text{ d.} & \text{---} & 100 \text{ l.} & \text{---} & 25 \text{ d.} \\ & & & & \text{facit } 108 \frac{6}{23} \end{array}$$

But I must gain 11 l. that is, $2 \frac{7}{23}$ more; therefore this must be gained by Time.

Thus:

$$\begin{array}{rcl} 6 \text{ l.} & \text{---} & 12 \text{ mon.} & \text{---} & 2 \text{ l.} & \frac{7}{23} \\ & & & & \text{facit } 4 \text{ mon.} & \frac{84}{133} \end{array}$$

This 4 mon. $\frac{84}{133}$ must be subtracted from 12 mon. and the remainder is the answer to the question.

$$\text{facit } 7 \text{ mon. } \frac{54}{133}$$

If one Yard cost 2 s. 9 *d.* ready money, at what rate must it be sold for 3 mon. $\frac{1}{2}$ to lose 8 l. per cent.

First, see what rate it must be sold for in ready money to lose 8 l. per cent.

Thus:

$$\begin{array}{rcl} 100 \text{ l.} & \text{---} & 33 \text{ d.} & \text{---} & 92 \text{ l.} \\ & & & & \text{facit } 30 \text{ d. } \frac{9}{23} \end{array}$$

If 30 d. $\frac{9}{23}$ be a ready money price, I must

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must sell it for more, in regard I must stay 3 mo. $\frac{1}{2}$ for my money. Therefore let 100 l. be your first number, and 100 with the Interest for 3 mo. $\frac{1}{2}$ be the second number, and the last *facit* your third number, thus;

$$100 \text{ --- } 101 \text{ l. --- } 15 \text{ s. --- } 30 \text{ d. } \frac{9}{25} \\ \text{facit } 30 \text{ d. } \frac{8913}{10000}$$

A Mercer buyeth Silk at 14 s. a yard for 7 mo. at what rate must he sell it again for ready money to gain 16 per cent. without gain upon gain?

First, see what the yard is worth in ready money, thus;

$$103 \text{ l. --- } 10 \text{ s. --- } 100 \text{ --- } 14 \text{ s.} \\ \text{facit } 13 \text{ s. } \frac{109}{207}$$

$$\text{Then say, if } 100 \text{ l. --- } 13 \text{ s. } \frac{109}{207} \text{ --- } 116 \text{ l.} \\ \text{facit } 15 \text{ s. } \frac{143}{207}$$

The third Head.

When there is gained or lost per cent. to know what the Commodity cost.

Example.

If 10 yards of Cloth be sold for 16 s. per yard, and there be 6 l. 10 s. loss per cent. the question is, how much the 10 yards cost?

First, subtract the loss from the 100 l.

$$6 \text{ --- } 10 \\ \text{--- ---}$$

$$93 \text{ --- } 10$$

2. Let

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2. Let the Remainder of 100 *l.* when there is Loss; and the gain added to 100 *l.* when there is gain, be the first number; let the price be the second number, and 100 *l.* the third.

If 93 *l.* 10 *s.* — 8 *l.* — 100 *l.*

facit 8 *l.* 11 *s.* $\frac{423}{187}$

If 20 *lb.* of Cloves be sold for 7 *s.* the pound, and I gain 9 *l.* per cent. The question is how much the whole 20 *lb.* cost me?

$$\begin{array}{r} 20 \\ 7 \\ \hline 14|0 \\ \hline \end{array}$$

100 *l.* — 7 *l.* — 100 *l.* *facit* 6 *l.* $\frac{46}{108}$

If I sell 28 Ells of Cloath for 4 *s.* per Ell, and thereby lose 24 per cent. I demand what the whole piece cost?

76 *l.* — 112 *s.* — 100 *l.* *facit* 7 *l.* 7 *s.* $\frac{7}{19}$

If 13 C. $\frac{1}{2}$ of Indico be sold for 36 *l.* and I gain 13 *l.* per cent. I demand how much the C weight cost?

113 — 36 — 100 *facit* 32 *l.* $\frac{14}{113}$

If 276 Fother of Lea¹, each 19 C $\frac{1}{2}$ be sold for 256 *l.* at 5 months, I gain 11 per cent.

per

per an. the question is, how much the whole cost ready money

$$12 \frac{55}{12} \text{ --- } 256 \text{ --- } 100 \quad \text{facit } 244 \frac{125}{12}$$

The fourth Head.

If Wares sold at such a rate there is so much gained or lost per cent. how to know what would be gained or lost, if sold at another Rate.

Example.

If Cloth sold at 8 s. the yard be 10 per cent. profit, what gain or loss per cent. should I have had, if sold at 7 s. per yard?

In questions of this nature, let the first price be the first number; 100. l. with the profit added, or loss subtracted, the second number; and the other price the Third number.

Example.

$$\text{If } 8 \text{ s. --- } 110 \text{ l. --- } 7 \text{ s.} \quad \text{facit } 96 \text{ l. } \frac{1}{2} \frac{1}{2}$$

Lost per cent $3 \text{ l. } \frac{2}{1}$

If one Gallon of Wine be sold for 9 s. and I lose 8 per cent. what shall I win or lose when 3 Gallons are sold for 25 s. 10 d.

$$\text{If } 27 \text{ s. --- } 92 \text{ l. --- } 25 \text{ s. --- } 10 \text{ d.}$$

facit 11 l. $\frac{99}{81}$ per cent. loss.

If 10 yards be sold for 4 l 10 s. I lose 12 per cent. What shall I win or lose if I sell the same for 9 s. 9 d. per yard?

$$9 \text{ s. --- } 88 \text{ l. --- } 9 \text{ s. --- } 9 \text{ d.}$$

facit 4. l. $\frac{2}{3}$ loss per cent.

K 3

CHAP.

CHAP. XXIV.

Of Alligation.

I. **A**lligation is so named, because it teacheth to knit or bind together divers things of unequal prices, whereby to find how much of each must be taken according to the question propounded.

It is commonly divided into two parts
viz.

*Alligation Medial, and
Alligation Alternate.*

II. *Alligation Medial* simple in it self is no more than to discover or find out a common Medium, Rate, Price, or Proportion in the mixture of divers things together, which is performed by reducing the several prices to one Denomination.

Then multiply the quantity of each parcel by its price, and add all the Products together; the which total divide by the number of all the parcels that are to be mixed, and the Quotient is the Answer to the Question demanded. For,

As the whole Quantity is to the whole price, so is 1 to its own price.

Ex.

Example.

A Mealman hath several sorts of Meal of several prices, and would mix them so that the quantity mixed might be one common price, viz.

3 Bushels at 3 s.—5 d. a Bushel.

4 Bushels at 5 s.—6 d. a Bushel.

6 Bushels at 4 s.—8 d. a Bushel.

Now the question is, what one Bushel of this mixture is worth.

bush.	s.	d.	bush.	s.	d.	bush.	s.	d.
3 at 3—5			4 at 5—6			6 at 4—8		
3			5			4	s.	d. bush.
<hr/>			<hr/>			<hr/>		
9			20			24	10—3—3	
1			2			3	22—0—4	
0—3						1	28—0—6	
<hr/>			<hr/>			<hr/>		
10 s.	3 d.		22 s.			28	6 0—3—13	
			l.	s.	d.		3 l. 0 s. 3 d.	
<hr/>								
13—3—0—3—1								

facit 4 s. 7 d. $\frac{8}{13}$ per Bush.

An Hostler mixed Provender for Horses, viz.

5 Bushels of Oats at 3—6 per Bush.

3 Bushels more at 4—8 per Bush.

2 Bushels of Malt at 2—2 per Bush.

4 Bushels of Beans at 5—3 per Bush.

The question is, what one Peck of this Mixture is worth? K 4 Bush.

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bush. s. d. bush. s. d. bush. s. d. bush. s. d.
 5 at 3--6, 3 at 4--8, 2 at 2--2, 4 at 5--2

Reduce each quantity into pecks, each price into pence, and multiply one by the other : Then say as before,

If 56 pécks--682 *d.* 1 peck *facit* 12 *d.* 2

How to prove Alligation Medial.

Compare the total value of the several mixtures, with the value of the whole mixture, and if they come both alike, the work is true ; as in the former *Example* may appear.

	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>
5 {	3	6	0	17	6
3 { Bushels at	4	8	0	14	0
2 {	2	2	0	04	4
4 {	5	3	1	01	0
	<hr/>				
	2--16--10				
	(1				
	8 (0				
	682 (5 6				
	x x x				
	x 2--16--10				

An

Ch. XXIV. Of Alligation. 201

An Alehouse-keeper mixeth 3 sorts of Ale together, viz. 15 Gal. at 4 d. $\frac{1}{2}$ per Gal. 22 Gal at 5 d. per Gal. 20 Gal. at 6 d. per Gal. The question is, what one Gallon of this mixture is worth?

facit 5 d. — 0 qrs. — $\frac{20}{3}$

A Refiner having 10 lb. of Silver Bullion of 8 ounces fine. 12 pound of 6 ounces fine, and 11 pound of 9 ounces fine, is desirous to melt all together, and to know what fineness a pound weight of this Mass shall be?

l.		l.		l.		
10	—	12	—	11	†	11
8		6		9		12
<hr/>		<hr/>		<hr/>		10
80		72		99		—
						33
						251

33 — 251 — 1 facit 7 oz. $\frac{20}{3}$ fine

Or thus

$$10 \times 8 = 80$$

$$12 \times 6 = 72$$

$$11 \times 9 = 99$$

$$33 = 33$$

$$80 + 72 + 99 = 251$$

$$251 \div 33 = 7 \text{ oz. } \frac{20}{3} \text{ fine}$$

$$33 \times 7 = 231$$

$$251 - 231 = 20$$

$$20 \div 3 = \frac{20}{3}$$

Note that a \times thus, doth signifie Addition, and two lines thus = Equality or Equation, but a \div thus Multipli-

Then say if

III. It will be necessary here to acquaint

K 5

you

you, that as Silver is estimated 12 ounces to the pound and 20 penny weight to the ounce; so an ounce of Gold is divided into 24 parts called Carects. Now, Refiners, Goldsmiths, and Mint-masters, do distinguish the differing fineness of either, according as it endureth the fire. As for example, an ounce of Gold being tried loseth 3 Carects, it is estimated 21 Carects fine; if it loseth 10 penny weight, it is esteemed 11 ounces and 10 penny weight fine, &c.

A Goldsmith is to melt 9 lb. $4\frac{2}{3}\frac{1}{2}$ of Gold Bullion of 16 Carects fine, with 7 lb. $6\frac{2}{3}$ of 22 Carects fine; the question is, how many Carects fine a pound of this mixture is worth?

Reduce them into $\frac{1}{2}$ ounces, and work as before.

facit 18 Car. $\frac{14}{17}$ fine

Or thus,

$$\begin{array}{rcl} 225 & \times & 16 = 3600 \\ 180 & \times & 22 = 3960 \\ \hline \end{array} \quad \begin{array}{rcl} 225 & \times & 180 = 40500 \\ \hline \end{array}$$

Then say,

If 405 — 7560 — 1 *facit* 18. Car. $\frac{14}{17}$ fine

A Mint-master hath 60 lb. weight of Gold
of

Ch. XXIV. Of Alligation. 203

of 23 Carects fine, and 80 lb. weight of 19 Carects fine; the question is, whether there ought any Alloy to be mixed with it, to make a pound of this Mixture to be 21 Carects.

An Alloy is a Mixture of some baser Metal, as Copper, &c. to moderate the fineness of it.

23	19	1380	60
60	80	1520	80
1380	1520	2900	140
140	2900	I facit 20 $\frac{2}{7}$ Carects.	
fine; but it should be 21 Carects fine.			

Wherefore I conclude this Mixture is not fine enough by $\frac{2}{7}$ of 20 Carects fine, therefore no Alloy is to be used, but more Gold to be put in.

The second part of the Rule of Alligation.

1. The former Rule required only a common rate or price from the whole of several quantities mixed together, but this requires a price and quantity in general, composed of such particulars as the Mixture is to be made of, and the parts to be taken proportionably according to the price, quantity, or quality of each other.

Example.

A Tobacconist having several sorts of Tobaccos, as some at 2 s. a Pound, others at 3 s. a Pound, others at 6 s. a Pound, and the best at 7 s. a Pound, and is desirous to mix 112 Pound together, so that he might sell the whole mixture for 4 s. a Pound: the question is, what quantity of each must be taken to make up this mixture.

In order to the working of this Question, and others following;

First set down the common number (or price) propounded (towards the left hand) which is 4 s. and likewise the prices given, viz. 2 s. 3 s. 6 s. 7 s. thus orderly one under another, as you have learned in Addition.

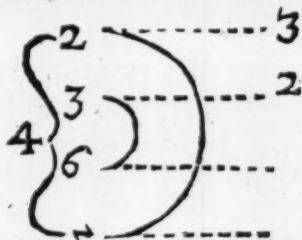
$$\begin{array}{r} \{ 2 \\ 4 \{ 3 \\ 6 \\ \{ 7 \end{array}$$

2. Observe what sums are greater and what are lesser than the common number, and couple a greater and a lesser together, by making a Simicircle from one to the other: for two greater or two lesser cannot be mixt together, because two lesser being thus taken can never make so many as the com-

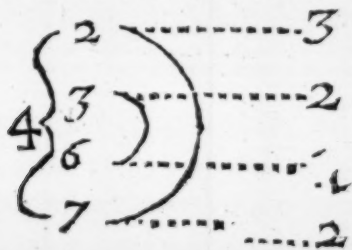
common number, and two greater will be too many.



3. Having thus linked them, observe what the difference is between each of the greater Sums, and the common price; the which difference is set directly against his fellow, which is linked with him.



Then likewise mark the difference between the lesser numbers, and the common number, and set each difference thereof against that which is linked with it.



Lastly,

Lastly, add all the differences into one Sum, which ought to be the first number in the Rule of Three; and the whole quantity to be mixed the second, and each particular Difference the third.

$$\begin{array}{r}
 2 \text{ ----- } 3 \\
 3 \text{ ----- } 2 \\
 4 \left\{ \begin{array}{l} 6 \text{ ----- } 1 \\ 7 \text{ ----- } 2 \end{array} \right. \\
 \hline
 8
 \end{array}$$

Then work these according to the Rule of Three, and the fourth number will declare the exact proportion of the mixture.

For as the whole difference is to the whole quantity, so is each particular difference to each particular mixed.

l.

8—112—3 *facit* 42 for the first sort.

8—112—2 *facit* 28 of the second.

8—112—1 *facit* 14 of the third.

8—112—2 *facit* 28 of the fourth.

112

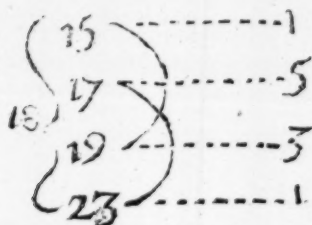
To prove this and the like questions, multiply the whole quantity mixed by the common price, as here 112 by 4 *facit* 448.

2. Mul-

Ch. XXIV. Of Alligation. 207

2. Multiply all the particular quantities found by its own price, as 42 by 2. 28 by 3. &c. and if the total of all the Products agree with the former Sum (448) your work is well done.

A Vintner hath 4 sorts of Wine of several prices, viz. some of 15 d. a Gallon, 17 d. a Gallon, 19 d. a Gallon, and 23 d. a Gallon; of which he is minded to mix the quantity of 32 Gallons. The question is, how many Gallons he must take of each sort, to make the Gallon worth but 18 d.



			10	
			Gall.	
10	—	32	—	1 facit 3 $\frac{1}{2}$
10	—	32	—	5 facit 16
10	—	32	—	3 facit 9 $\frac{3}{4}$
10	—	32	—	1 facit 3 $\frac{1}{4}$

32

A

A Druggist had 3 sorts of Drugs; one was valued at 4 s. the pound, another sort at 7 s. the pound, the third sort at 11 s. a pound; out of these sorts he made two parcels; either of them to be 30 pound weight, whereof one of them thus mixed to be sold for 9 s. the pound, and the other for 10 s. the pound. How many pound must be taken of either sort to make each mixture?

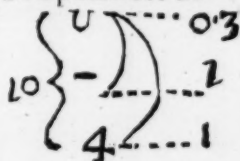
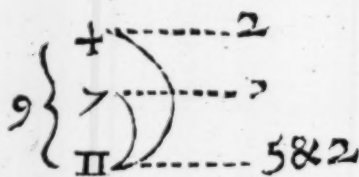
The price propounded in the first proposition is 9 s. and in the other 10 s. Likewise the prices given are 4 s. 7 s. and 11 s. but seeing two of these given prices are lesser than the common price, I cannot proceed to the former example: Therefore I couple the two lesser with the greater, and their differences I set against the greater, and the difference of the greater against the two lesser, then work as before.

For as 11 the whole difference, is to 30 the whole quantity, so is 2 the first difference unto 5, and $\frac{5}{7}$ for its quantity.

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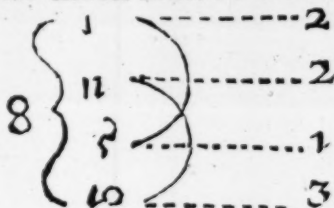
Proposition 1.

Proposition 2.



11—30—2 <i>fa.</i> 5 $\frac{5}{11}$	11—30—9 <i>fa.</i> 24 $\frac{6}{11}$
11—30—2 <i>fa.</i> 5 $\frac{5}{11}$	11—30—1 <i>fa.</i> 2 $\frac{1}{11}$
11—30—7 <i>fa.</i> 19 $\frac{1}{11}$	11—30—1 <i>fa.</i> 2 $\frac{8}{11}$

Barly at 7 Groats the Bushel, Wheat at 11 Groats the Bushel, Rye at 5 Groats the Bushel, and Oats at 10 Groats the Bushel, are so to be mixed as a 100 Bushels of the mixture may be sold for 8 Groats the Bushel: the question is how much must be taken of each sort.



9—100—3 <i>facit</i> 33 $\frac{3}{9}$	Barley.
9—100—2 <i>facit</i> 22 $\frac{2}{9}$	Wheat.
9—100—1 <i>facit</i> 11 $\frac{1}{9}$	Rye.
9—100—3 <i>facit</i> 33 $\frac{3}{9}$	Oats.

100

How

Of Alligation. Ch. XXIV.

How much Alloy must I mix with Bullion of 11 ounces $\frac{1}{8}$ fine, to abase the Bullion, to 6 ounces $\frac{1}{2}$ fine?

$$\begin{array}{rcl} \text{Ounces} & \text{Ounces} & \\ 6 \frac{1}{2} & \left\{ \begin{array}{l} 11 \frac{1}{8} \\ 0 \end{array} \right\} & \left\{ \begin{array}{l} 6 \frac{1}{2} \\ 5 \frac{1}{8} \end{array} \right\} \end{array}$$

By this Alligation there must be taken 5 ounces and $\frac{1}{8}$ of Alloy, to mix with the 6 oz. $\frac{1}{2}$ of Bullion.

A Goldsmith hath 4 sorts of Gold, one finer than another, whereof one is 18 Carects fine, 20 Carects, 16 Carects fine, and the fourth 22 Carects fine. All these he would mix with such an Alloy, as that the whole mixture of 150 oz. should be 15 Carects fine; the question is, how much must be taken of each sort?

To answer this, and others of this nature, set down as before the Rate demanded at the left hand, and the particulars under one another, and subscribe a Cypher under all for the Alloy unknown, to set the Alloys difference, which is 15 against all the other Sums, according to the Example. Then work as before, saying, as 76 the whole difference is to 150 the whole quantity, so is each particular difference to the quantity sought.



76—150—	15	facit	29	$\frac{2}{3}$
76—150—	15	facit	29	$\frac{2}{3}$
76—150—	15	facit	29	$\frac{2}{3}$
76—150—	15	facit	29	$\frac{2}{3}$
76—150—	15	facit	31	$\frac{2}{3}$

150

A Refiner hath several sorts of Bullion, viz. 30 lb. of 6 oz. fine, 6 of 8 oz. fine, 12 lb. of 9 oz. fine ; and he would so mix them together, that a pound thereof should bear 6 ounces fine. The demand is, whether any Alloy ought to be mixed with it, and how much ?

First, see by Alligation Medial what fineness an ounce of this mixture will bear when mixed together, then work as in the last question save one.

			180	30
30	16	12	128	16
6	8	9	108	12
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
180	128	108	416	58

$$\begin{array}{r}
 1 \\
 10 \\
 416 \text{ (7 oz. } \frac{5}{29} \text{)} \\
 \hline
 58
 \end{array}$$

Therefore it is manifest that Alloy must be mixed to Alloy from 7 oz. $\frac{5}{29}$ to 6 oz. which is to be done thus; and you will find for every 6 ounces of Bullion he must take 1 oz. $\frac{5}{29}$ of Alloy to mix with it.

$$\begin{array}{r}
 6 \left\{ \begin{array}{l} 7 \frac{5}{29} \\ 0 \end{array} \right\} - 6 \\
 \hline
 0 - 1 \frac{5}{29} \\
 \hline
 7 \frac{5}{29}
 \end{array}$$

CHAP. XXV.

Of Instructions for the measuring of any Superficies, Board, Glass, Hangings, Pavements, &c.

I. **O**bserve that Board and Glass are usually measured by the Foot, and the Foot containeth 144 Inches.

There

Ch. XXV. Of Measuring. 213

There is a Table 24 foot in length, and 3 foot wide. I demand how many foot is contained therein?

The Rule is.

Multiply the length by the breadth, and the Product giveth the content of the whole.

$$\begin{array}{r} 24 \\ 3 \\ \hline \end{array}$$

facit 72 foot.

There is a Table of 20 foot 9 Inches long and 3 foot 8 Inches Broad ; how many foot doth it contain ?

Reduce them into Inches, and multiply as before.

facit 76 foot $\frac{1}{2}$

How to measure Glafs.

There is a house hath 26 panes of Glafs in the Window, each pain being 2 foot 3 inches long, and 18 inches wide : The question is, how many foot of Glafs is contained in all ?

facit 87 foot $\frac{3}{4}$

Pavements and Hangings are usually measured by the Yard.

One Yard in length is 3 foot.

One Yard square upon the Superficies is 9 foot)

How

How to measure Pavements.

There is a piece of Ground to be paved, containing 49 yards in length, and 31 yards in breadth; how many yards is contained therein?

facit 1519 yards.

A Gentleman had his Door paved, being 37 yards 2 foot one way, and 7 yards 1 foot the other way; I demand how many yards are there in all?

facit 276 yards $\frac{2}{3}$.

A Suit of Hangings 45 yards $\frac{1}{2}$ long, and 2 yards $\frac{1}{4}$ broad; how many yards are there in all?

Divide by 16, because 16 quarters is one yard square.

facit 102 yard $\frac{1}{2}$.

*Instructions for the measuring of Solids.
as Timber and Stone, &c.*

12 Inches is one foot in length.

144 Inches is one foot square superficies.

1728 Inches is one foot solid.

There is a Stone of 4 foot long, 3 foot broad, and 2 foot deep; I demand how many square foot is contained therein?

The

Ch. XXV. *Of Measuring.* . 215

The Rule is :

Multiply the three Dimensions one into another, and the Product is the Answer.

facit 24 foot.

A stone of 5 foot 9 Inches long, 4 foot 7 Inches broad, 2 foot 8 Inches deep ; I demand how many foot there is contained in the said Stone ?

Reduce all the Dimensions into Inches, and divide by 1728.

facit 70 foot $\frac{5}{12}$.

How to measure Timber.

A piece of Timber 20 foot 8 inches in length, 2 foot 5 inches broad, and 2 foot thick ; how many foot doth it contain ?

facit 99 foot :

A Countrey-man borrowed of his Neighbour a Stack of Hay, the content whereof was 40 foot square.—When the time of payment came, he told his Neighbour he could not pay him all together, but he would pay him 20 foot square at that time, and 20 foot square more at another time afterwards, which he performed, The question is, whether he paid the full quantity borrowed, or what was wanting thereof ?

40	20
40	20
<hr/>	<hr/>
1600	400
40	20
<hr/>	<hr/>
64000 borrowed	8000
<hr/>	8000
	<hr/>
	16000 paid.
	<hr/>

So that he paid but one quarter of the quantity he borrowed.

There are many things of this nature, that might be brought in under these two heads, which are more difficult; as the measuring of Land of several forms, and the measuring of Timber, Stone, or other things not equally squared; the well managing thereof would require a Treatise of it self, which I omit, in regard it doth not so much concern my practice, nor my intention in this Tract; but I judge this sufficient for the present.

L' A U S D E O.

F I N I S.

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24
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T